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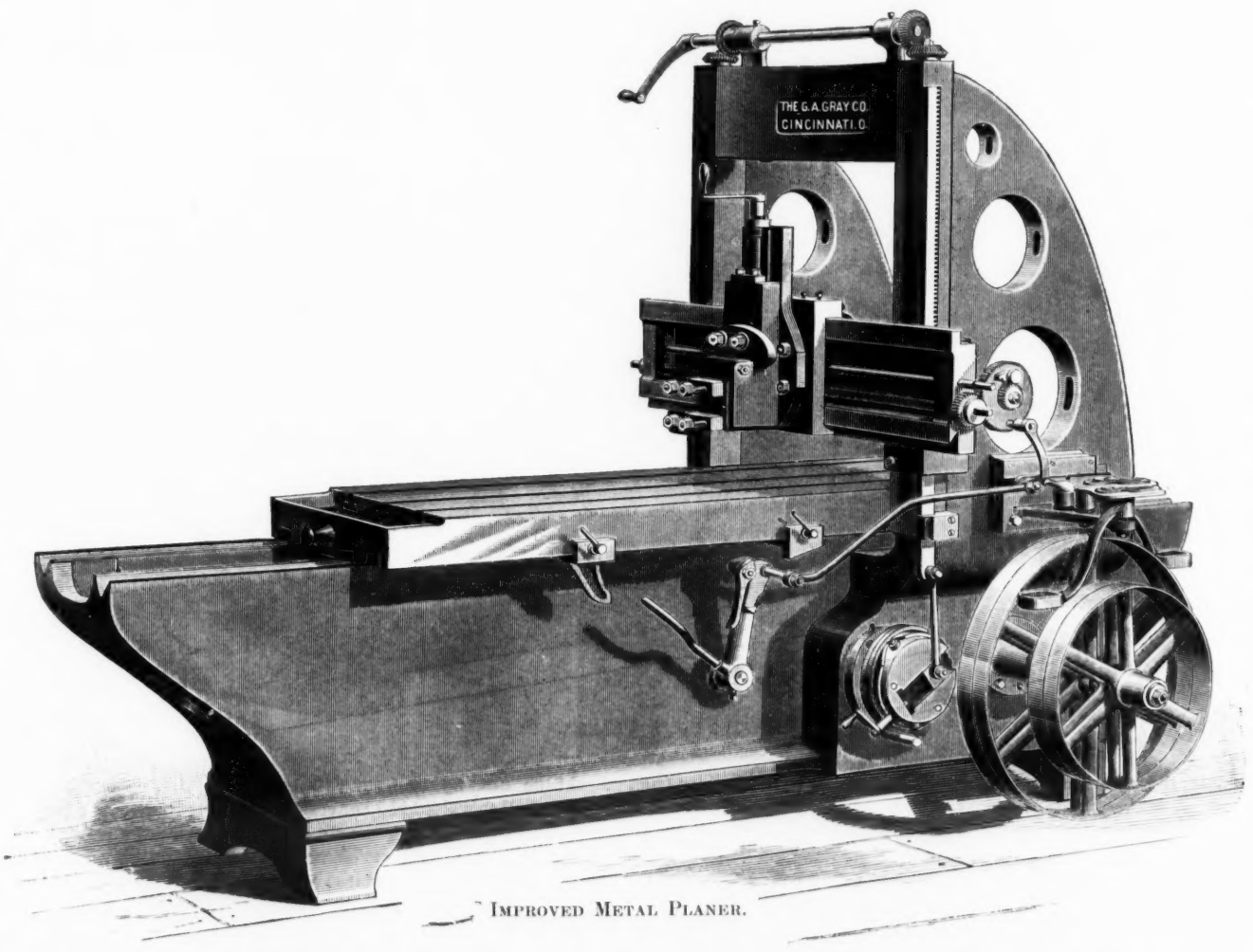
Improved Metal Planer.

The G. A. Gray Co., Cincinnati, Ohio, have recently added some new features to their iron planers, which are shown in the illustration on this and the succeeding page. It will be noticed that there is a shifting lever on each side of the machine. These levers are connected by means of a shaft which runs directly through the stationary shaft upon which the bull wheel revolves. By means of these levers the operator may control the action of the platen from either side of the machine.

The lever on the right, or front side of the planer, shows a trip, to be used when it is desired to allow the platen to run back without disturbing the dog. Heretofore this trip has been in the back dog, but since these machines have been quickened on the backward stroke to 4 to 1, and above, it is found to be difficult to throw out this trip while the platen is in motion. But with the trip in the shifting lever—which is at rest during the stroke—it is accomplished with more certainty. Another point is claimed in favor of this form of shifter lever: The vertical action allows it to be placed close under the platen, where it is less in the way of the operator than when made to swing horizontally.

Other characteristics in this planer, such as the great depth of bed and large driving pulleys, are about the same as when the machine was first brought out.



IMPROVED METAL PLANER.

The duplex shifter device is claimed to be of great importance when two heads are used, as, for instance, when the left-hand head is in action at the extreme end of the cross-slide, then the operator may adjust the cut without walking around to the front side to stop and start the platen.

Postmaster-General Wanamaker is said to be working up the plan first proposed, we believe, by General James, of establishing, in large cities, additional stations, located in drug stores, or other stores, and under control of a clerk furnished by the owner of the store. At these places it is proposed to sell money orders and register letters, as well as receive anything to go by mail. A similar plan is in operation in Philadelphia, and is said to work very satisfactorily. New York city is the next place where it proposed to establish these branch offices.

The Suction of a Chimney.

By W. H. Booth.

II.

In the last article under this head we came to the conclusion that a chimney had no power of suction, and proposed to inquire into the means taken to augment the draught. These are four in number—namely, a steam jet before the furnace, the same behind the furnace, a fan exhausting air from the furnace, and a fan blowing air into the furnace. Of these the second is the most common, for it is found in all locomotives. The steam blast, as applied to a locomotive, does absolutely produce a partial vacuum in the smoke-box, and therefore the funnel of a locomotive may be said to have a power of suction in itself, and the external atmosphere rushes into the smoke-box through the furnace, to fill up the constantly maintained void in the smoke-box. When at rest, a locomotive is thus deprived of draught almost entirely, and, to remedy this, a jet is applied, using boiler steam direct, and blowing up the funnel. The steam blast of a locomotive is obtained by contracting the exhaust pipe from the cylinders, and is responsible for a considerable increase in the back pressure on the piston. In an ordinary 18″x24″ engine, each pound of back pressure at 300 revolutions is equal to 18 horse-power. As, however, a draught is a necessity, this amount must be spent for each pound of back pressure necessary to give the draught.

The late Professor Rankine was of the opinion that a locomotive consumed only 18 pounds of air per pound of fuel, as against 24 pounds in an ordinary chimney-draught furnace. A steam blast may then be considered as saving a fourth of the waste heat. The waste heat is about half the utilized heat in an ordinary draught.

At 600 effective, or obtained horse-power, the waste heat of the furnace is thus 300 horse-power. A fourth of this is 75 horse-power, and, to save this, a steam blast pressure of even four pounds extra back pressure would be an economy. The steam jet then behind the furnace simply acts by removing the pressure from above the fire, and so allows of the forcible and rapid entrance of the external air through the fire.

In the first case of a steam jet before the furnace, this is variously applied above or below the fire. When applied above, it is usually for the purpose of assisting the entrance of air through the fire door slots or perforations, for the purpose of burning the gases evolved from the fresh charges of fuel. In this position a steam jet acts by pushing forward the gases and air over the fire towards the chimney, and outside fresh air naturally follows.

When a steam jet is applied to the ash-pit, it is similarly with the idea of pushing forward the entering air, and forcing it through the bars. It assists the draught by overcoming the friction of the mass of fire on the grate in the way we shall see subsequently.

We now come to fan methods. One application of fans is behind the furnace, and consists in applying fans to withdraw the products of combustion from the flues, and discharge them into a low chimney. The only instance of this method which the writer has seen, is that of a woolen factory near Halifax, England, where each of four or five boilers has a separate fan, discharging into a chimney which does not rise above 70 feet *i. e.*, to the eaves of the building. All the products of combustion pass right through the fans, and the results appear satisfactory. Their action is similar to that of steam blast—the formation of a partial vacuum into which air rushes through the furnaces.

Finally we come to the fourth method—a fan blowing air into the furnace, and constituting the method of forced draught, as now usually understood as such. We have already alluded to the causes for the gradual stoppage of air flow through a furnace and flues. A chief cause of stoppage is the enormous resistance offered by the fuel on the grate to the passage through it of air. Few grates themselves give more than 50 per cent. air space, and this small proportion is covered by the fuel above, so that a gauge difference of $1\frac{1}{2}$ inch at the chimney may be only $\frac{1}{2}$ inch, or $\frac{3}{10}$ inch or less over the fire.

This means that, whereas the heated column of gas in the chimney is lighter than the same height of a cold column by an amount equal to $1\frac{1}{2}$ inch head of water, the bulk of this difference is made up between the chimney and furnace by the expansion of the air entering cold and rising in temperature as it passes the burning fuel. It expands both ways—forwards to the chimney and back to the furnace door, and so very considerably opposes the entering air. Where the ash-pit has ample opening it can show no gauge difference. I have seen a draught gauge made to show a draught in the ash-pit, but this was due simply to induction caused by rush of entering air past the tube end which led to the gauge.

If above a fire there is a fair gauge difference, and yet only a sluggish combustion of fuel on the grate, we know that the passages between furnace and chimney are ample, but that the fuel and grate are insufficiently porous to admit air. If the water gauge above the grate is low, we know the obstruction to be in the flues. In this case, if a fan were applied to force air through the grate, the flames would very probably be forced out at the furnace door. Here then

we are confronted by the limit of application of a fan draught, for the effusion of flame at the door shows the limit of pressure allowed, which must be kept within such a gauge as not to bring about the above result. This limit is only to be extended by making the way to the chimney clear of obstruction, or, if too small, by enlarging the flues. If, however, the furnace doors and front are tightly fitted, the intensity of blast may be such as to force the gases to the chimney in spite of narrow flue, in which case, however, whenever it may be necessary to open the furnace door, the blast must be moderated.

Forced draught may be moderate or intense. When moderate it is understood that a sufficiency of pressure is used to fairly overcome the friction of the fuel on the grate. Such a draught may be said to place the chimney in a condition to work against the resistance of the flues only; that is to say, the full atmospheric pressure is brought into the furnace—above the fuel—in place of being left below the grate to find its way in. By using a fan for this purpose, we can increase the coal consumption per square foot of grate to double an ordinary rate, or to 40 pounds per hour. This enables us to use a smaller grate, to keep a thicker fire, to obtain a more intense combustion, and to reduce the surplus of air above that usually necessary very considerably. Usually it is considered, as already stated, that double the chemical minimum is used for an ordinary chimney draught. Let us consider how a forced draught reduces this.

When air first touches incandescent carbon as it enters the furnace by the grate, the carbon is completely burned to (CO_2) its dioxide. As this gas travels up through the fire it takes up more carbon, and becomes, so to speak, unburned again, forming carbon monoxide 2(CO.) This gas comes out to the top of the fire, and is the cause of the lambent blue flame seen at the top of an open grate of hard coal or coke. There it is burning again to (CO_2) dioxide, because it gets fresh oxygen from the air of the room. In a furnace it may escape unburned. If it does, an immense loss is caused, for the burning of a pound of carbon thoroughly to dioxide produces three times the heat of the simpler combination.

As a fact, however, very much of the air which passes through the grate and fuel escapes contact with the fuel—the interior parts of the streams of air, for instance. Such unused air arrives in a heated state at the surface, and there, and at the bridge, combines with and burns the carbonic oxide (CO) so that loss is avoided. It is essential that the two gases be hot enough to unite. In spite of this demand for air at the surface of the fire, we still find as much going unused to the chimney as has been taken up by the carbon. When we force the draught, however, we can use a smaller grate, and can have a much thicker fuel bed. This insures that less free air shall pass through the fire untouched. It insures, also, that less carbonic acid (CO_2) shall get to the surface, and it also ensures the heating up of the free air that does pass, and the carbonic oxide to a good temperature, so that their combustion is more readily completed at the surface. In this way the surplus air is reduced, and economy results. Here it is very largely that forced draught proves an advantage. The disadvantage of chimney draught appears to be simply that the grate area has to be excessive in order that a working difference of pressure so small may force air enough through the obstructed grate, and yet the very increase of grate surface is, to a certain extent, but an exaggeration of the defects which demand it.

For hand-firing this system of forced draught is not so suitable, for the reason that when each fresh charge of coal is thrown on, there is no way of getting into the furnace, and above the fire, the temporary extra air necessary for consuming the hydrogens, for the air passing through the grate would prevent this. Such a combination demands that, at changing, the fan blast should be moderated. This is more than could be expected from hard-worked firemen, and, to be a success, an automatic device should act at each opening of the door, which would partially close the draught pipe throttle and open the air slides in the door, such automatic action to shut the air slides and open the draught throttle in about two or three minutes. With a continuous fuel feed, as from a mechanical stoker, the constant evolution of hydrogens is sufficiently provided with air in the surplus through the fuel, and no special means need be provided to give this.

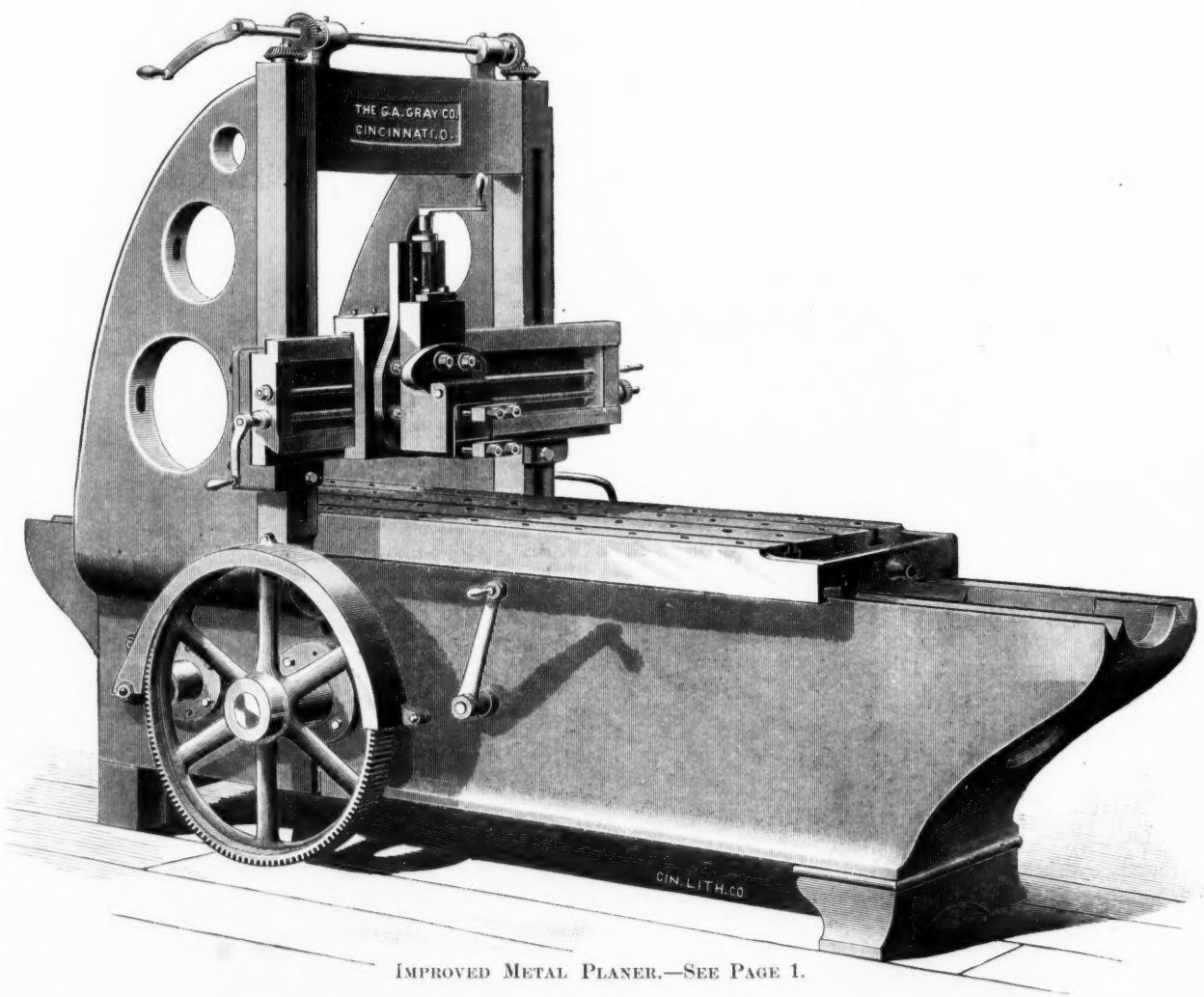
Where hand-firing is practiced, the closed stokehold system seems suitable. In this system the whole space before the boilers, or, when set in brickwork, the whole boiler, is enclosed in an air-tight casing, entrance to which is through an air lock, and in which casing the firemen work under the pressure of air forced into the hold by fans. The only outlet for the air is by the furnaces to the chimney. It is plain to see that in this method flames cannot come back from the furnace through the door when opened, for the pressure outside is as great as that under the grate. With a free course to the funnel, no amount of pressure could be maintained in the stokehold, for it would quickly lose itself through the flues. To keep up the pressure it is necessary to shut down the dampers at the chimney end until the escape of gases to the chimney is so throttled as to keep up the furnace pressure to the proper amount. The closed stokehold admits of combustion taking place in an atmosphere denser than the normal. The density is not materially greater, but such as it is the intensity and perfection of combustion are increased thereby. By compression of a mixture of air and coal gas, as in a gas engine, an explosion may be obtained, which is not possible with the uncompressed mixture. It is the compression which brings all the particles into closer contact, within striking distance of each other, so that ignition may extend throughout the mass. In a modified degree the same is the case with the lesser compression of the closed stokehold, but probably the chief advantage and economy are to be explained on the same basis as the moderate system already explained.

Even with ordinary chimney draughts thick fires up to 12 and 14 inches have been found superior to thin fires, and it is much to be thought that the superior economy of large boilers is due to the thicker fires possible in larger furnace tubes.

The surplusage of air appears more likely to be reduced towards its minimum by thick than by thin fires, for the former afford better opportunity for fuel contact and for breaking up the bulkier streams, but it must be noted that, with a fire too thick, all the air would be used up to form (CO_2) carbonic acid, and all this would be converted to monoxide, and there would be no air left to burn this at the surface, and enormous waste would ensue unless special provision for further air were made. It seems probable that this limit of thickness has not yet been reached in boiler furnaces, unless it be in deep locomotive fire-boxes; but it is very doubtful if even in these the fires could not be still thicker with advantage.

Though we started out to show a chimney had no suction, we have found that certain forced draughts produce the same action as a chimney that could really exert suction. Chimney draught really is simply outside pressure, and all forced draught from fans blowing towards the boiler, not from it, is simply an intensified form of chimney draught.

Full knowledge of the facts of each case are evidently required before we can determine whether the ash-pit damper or the chimney damper is proper to use, or when to use one and when the other. Even good firemen, unless they understand the nature and principles of combustion, may go wrong on this point, and defeat the ends aimed at by the designer of a steam plant. Unquestionably, forced draught, or perhaps assisted draught is a better term, will be more used in the near future than it has been, especially when the wastefulness of the present system is better comprehended. In round numbers the volume of smoke and gas coming out of a chimney is double the chemical minimum, and as such double volume all goes out from 300 to 600 degrees hotter than it entered, the wastefulness of excess of air is only too obvious. Already the oxygen of the air is diluted with nearly four times its bulk of inert nitrogen. It is, then, of special importance that as little needless nitrogen as possible be poured through a furnace, picking up heat all the time and wasting it at the chimney.



IMPROVED METAL PLANER.—SEE PAGE 1.

Dr. G. T. Swarts has placed before the Rhode Island Medical Society the results of a series of experiments with water filters, the gist of which ought to be given wide publicity. It is quite common belief that a domestic water filter, the operation of which will produce clear water, is a valuable acquisition. But the doctor's experiments show that most filters, when first used, remove part of the organisms from the water, but in their continued use the filtered water comes to be much worse than the unfiltered. It appears that the germs remaining in the filter multiply with great rapidity, and that, instead of removing the danger from them, the filter increases this danger enormously. Dr. Swarts tried many simple means of cleansing filters, but found in every instance the filtered water was at a disadvantage as compared with the unfiltered. An interesting point in regard to this is the operation of the large filters used to filter the entire water supply of a town. It is to be hoped that the doctor will continue his investigations by determining the effect upon the water of some of those that have been in use for two or three years. It may be found that the wise plan is to go far enough to get a supply of comparatively pure water rather than to depend upon any filtering process. Reasoning from analogy, it looks, in the light of Dr. Swarts' experiments, as if the filtering process, with a view to furnishing wholesome water, was worse than useless. But it is a subject that will bear further investigation.

Death by Electricity.

At the East River Electric Lighting Company's place, in this city, an accident occurred the other day, which, aside from its sad features, has a peculiar interest just at this time, when the subject of electrical executions is receiving so much attention; and accordingly it is receiving considerable attention among those papers which have been taking part in the discussion.

An expert electrician mounted a ladder to make some adjustment about a switchboard, and, the ladder slipping, he instinctively threw out his hands to grasp something. He grasped the wires in such a manner as caused sufficient electric energy to pass through his arms and chest to result in instant death, all signs seeming to indicate that he died without a moment's suffering. The current was of about 1,000 volts alternating, though it is not probable that he received its full force, owing to the probably imperfect contact. This seems to have been one of those accidents which will occasionally occur in spite

of all precautions, though it emphasizes the fact that all appliances used about a dynamo room should be constructed with a special view to preventing such accidents. Where a switchboard must be reached by means of a ladder, it should be so arranged as to prevent the possibility of slipping. This may be done either by providing sockets for the ladder to rest in at the bottom, or making it to hook over a proper support at the top. When a man finds himself falling, he instinctively grasps the first thing in reach, without thinking whether or not the grasp may be more disastrous than the fall it is intended to prevent. Every possible provision should be made against falling—and made in advance, without waiting for some one to be killed first.

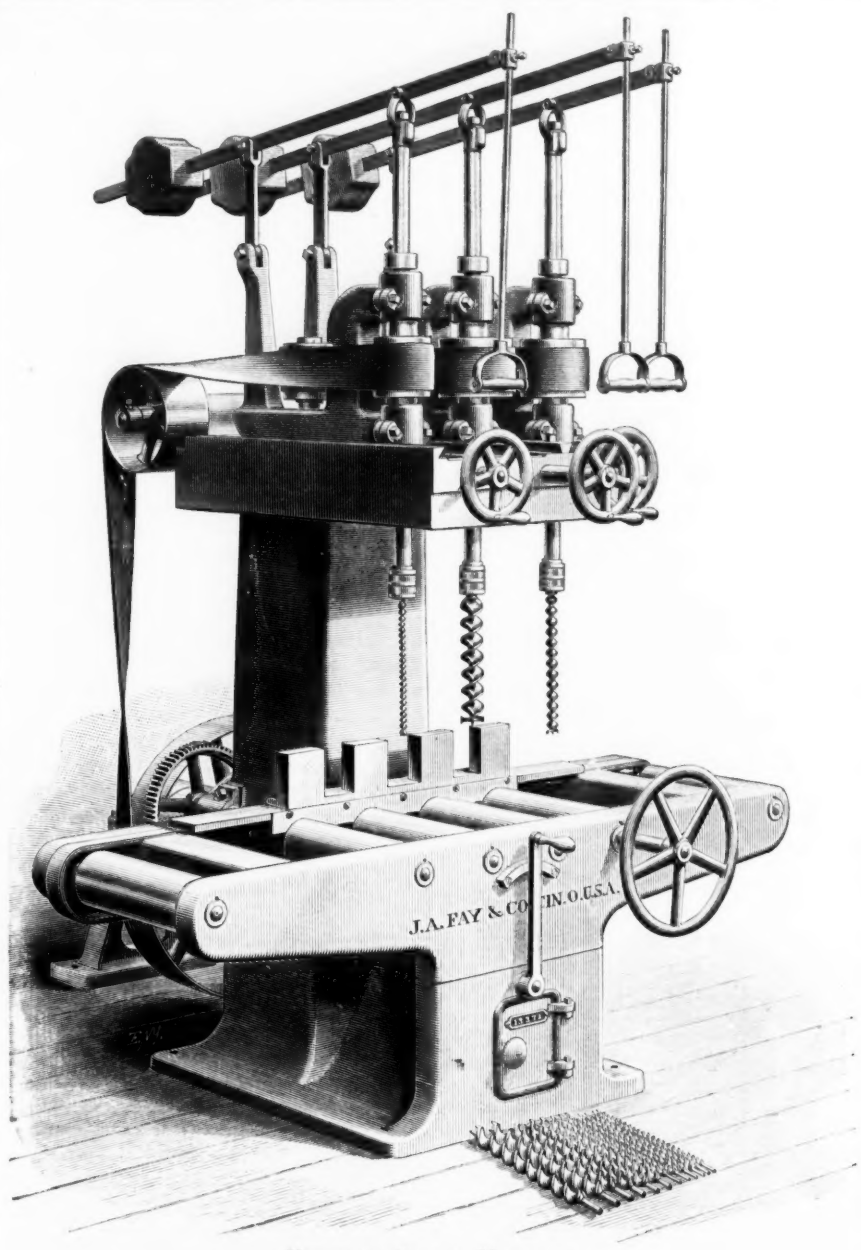
Improved Boring Machines.

We present herewith illustrations of two improved boring machines intended especially for car work, though, of course, well adapted to any work of similar character.

The upright machine, as will be seen, has three spindles, all driven by the same belt, and each one separately adjustable either vertically or across the stick, the latter adjustment being effected by means of screws and hand-wheels, as shown. The vertical movement of the spindles is by means of the counterbalanced levers shown. The transverse movement of the spindles is 12″, and their vertical movement sufficient to bore through timber 14″ thick. Stop collars are provided which gauge the depth of the boring.

The table has a series of large rollers, the two outside ones being driven by chains, and the internal rolls being connected and driven by gearing on the countershaft, that operates in either direction, moving the timber by power to the right or left by the movement of a lever in front of the table. A hand-wheel and screw is connected to the rolls in easy access to the operator for moving the timbers laterally by hand.

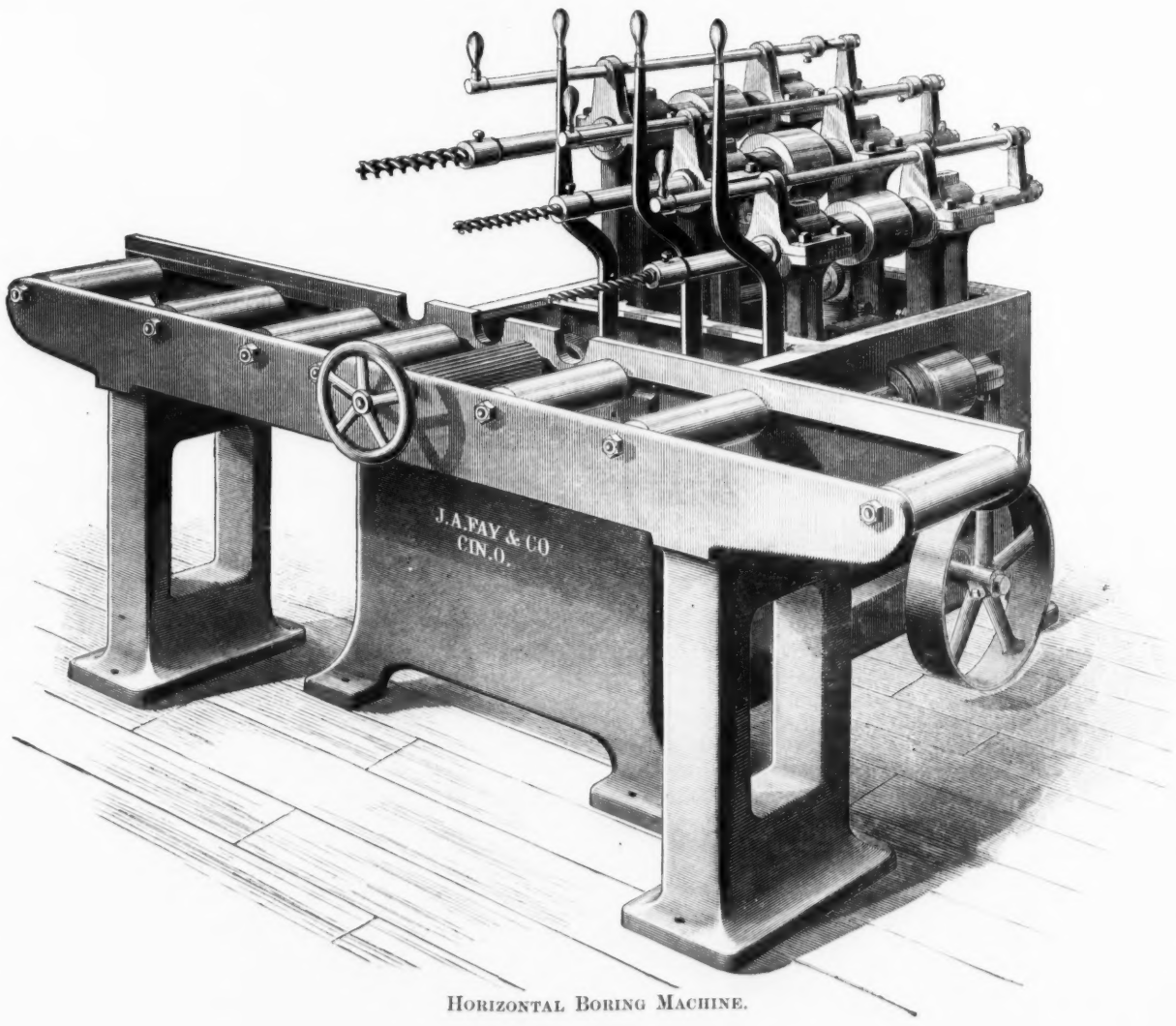
The tight and loose pulleys are 12″ x 5″, and should make 350 revolutions.



VERTICAL BORING MACHINE.

The horizontal machine, though shown with three spindles only, is made with four when desired. Each of these spindles is mounted in the top of a frame which moves up and down in planed ways by means of square-threaded screws actuated by friction gearing, each frame moving independently of the others, thus giving an independent vertical adjustment by power. This vertical movement is 10″, and the spindles have a longitudinal movement of 16″, being calculated to bore through 14″ of timber. The table is long and heavy, with rollers for the timber to rest upon, also a fluted roller and hand-wheel for moving it quickly to a definite point. The tight and loose pulleys are 12″ x 5½″, and should make 350 revolutions.

These machines are made by J. A. Fay & Co., Cincinnati, Ohio.



HORIZONTAL BORING MACHINE.

One of our English contemporaries credits an American iron founder with the statement that "The true principle of economy in melting iron is to handle the cupola in such a manner as to get as near as possible the full benefit of the fuel consumed, and at the same time use not more than is sufficient to melt the iron bright and hot." This is a statement which it is perfectly safe to say will never be contradicted. It is equivalent to saying that the proper way to manage a cupola is to manage it in the best possible manner, and is about as lucid and satisfactory as the comedian's definition of a Mascot. We might also explain the whole science of engine and boiler construction and management in the same way, by saying that they should be so constructed as to get the greatest possible amount of power out of the coal consumed.

Titles in America.

One of our English friends writes expressing some surprise at seeing it announced that Mr. Edison had been created an Italian count. He says: "Until quite recent years uninformed Englishmen have believed that the constitution of the United States precluded any holder of a title from being a legal citizen of the States, and that the acceptance of a title by an American citizen forfeited such rights as an American citizen. The question now is: Does the American constitution recognize titled persons as citizens; or, are those Englishmen right who state that the republicanism of Britain is a more genuine article than that of America? Seriously: Is America intending to set up a titled class which is fast becoming played out in England?"

The constitution of the United States does not prohibit citizens from holding titles, but does prohibit the granting of titles of nobility by the United States, and also prohibits any person who is holding an office of profit or trust under the United States from accepting "any present, emolument, office, or title of any kind whatever" from a foreign country. Since Mr. Edison holds no public office, there is nothing in our constitution to prevent his accepting any title which any foreign government may choose to confer upon him. It is not likely that Mr. Edison attaches any great importance to the possession of the title; and the use of it in connection with his name will probably be very infrequent in this country.

There are some people here, however, who, we do not doubt, would rejoice to see a nobility established here, and who, if they could obtain any title from a foreign government, would make the greatest possible use of it. These are the people who are least likely to receive such titles, however, because they have nothing but their wealth, ambition and some other disagreeable qualities to distinguish them from other people, and we are not aware that any foreign governments are at present in the business of selling titles outright.

Under the circumstances, we can see no impropriety in Mr. Edison's acceptance of the title conferred upon him; and, in fact, he could not decline it without seeming churlish. But his parading the title, or making use of it in this country, would be in the worst possible taste, and we have no idea that he would be guilty of it.

It is stated in the *Metallarbeiter* that iron can be coppered by dipping it into melted copper, the surface of which is protected by a melted layer of cryolite and phosphoric acid, the articles to be thus treated being heated at the same temperature as the melted copper. Another process consists in dipping the articles into a melted mixture of one part of chloride or fluorine of copper, five or six parts of cryolite, and a little chloride of barium. If the article, when immersed, is connected with the negative pole of a battery, the process is hastened. A third method consists in dipping the articles in a solution of oxalate of copper and bi-carbonate of soda, dissolved in 10 or 15 parts of water, acidified with organic gas.

There is building in a shipyard in Maine what is said to be the largest clipper ship in the world.

Practical Drawing.

BY J. G. A. MEYER.

EIGHTY-FIFTH PAPER.

616. Figs. 503 and 503*a* represent the same prism as shown in our last paper. In these figures we have represented the pyramid by broken lines, simply for the purpose of making the subject as clear as possible; but in reality the pyramid is assumed to be removed, so as to enable us to see clearly the opening in the prism made by passing the pyramid through it. In Fig. 503*a* it is plainly seen that the pyramid not only cuts the lateral face $a\ b\ a_3\ b_3$ of the prism in the line $i\ i_3$, but it also cuts the same face in the lines $a_5\ i$ and $a_7\ i_3$; again, the pyramid not only cuts the face $b\ c\ b_3\ c_3$ in the line $k\ k_3$, but it also cuts the same face in the lines $k\ c_5$ and $k_3\ c_7$. In our last paper we have explained the manner of finding the lines $i\ i_3$ and $k\ k_3$. Now that the lines $a_5\ i$, $a_7\ i_3$ $k\ c_5$ and $k_3\ c_7$ are also lines of intersection is easily proved. Take, for instance, the line $a_5\ i$. We know that the face $e\ f$ of the pyramid (Fig. 503*a*) is perpendicular to the vertical plane of projection; indeed, the projections (Figs. 503 and 503*a*) plainly show this to be so, hence the face $e\ f$ of the pyramid must cut the edge $a\ a_3$ of the prism in the point a_5. Now, since the point a_5 and i lie in the same face or plane, the straight line joining them is the line of intersection of the face ($e\ f$, $e_2 f_2\ p_2$) of the pyramid, and the lateral face $a\ b\ a_3\ b_3$ of the prism. The same remarks apply to the lines $a_7\ i_3$, $k\ c_5$ and $k_3\ c_7$.

617. Fig. 503*b* shows the appearance of the prism when viewed in a direction as indicated by arrow 1 (Fig. 503*a*;) or, in other words, it is the vertical projection of the prism with the axis of the opening perpendicular to the vertical plane of projection; consequently the line $d_4\ d_6$ in Fig. 503*b*, and a line coinciding with the line $b\ b_3$ in Fig. 503*a*, and the point d_2 in Fig. 503, represent one and the same edge of the prism; so also the line $a_4\ a_6$, the line $a\ a_3$, and the point a_2 are the projections of another edge of the prism; and, lastly, the lines $b_4\ b_6$ $b\ b_3$ and the point b_2 are the projections of third edge which is exposed to view in Fig. 503*b*. The edge represented in Fig. 503*a* by the line $c\ c_3$ and the point c_2 in Fig. 503 cannot be seen in Fig. 503*b*, because in the latter figure this edge is hidden by, and coincides with the line $a_4\ a_6$. Now, thoroughly understanding this interpretation of the lines and points which make up the different projections of the prism, there should not be any difficulty in understanding the manner of finding in Fig. 503*b* the projection of the opening in the prism.

This projection of the opening cannot be found without the aid of Figs. 503 and 503*a*; hence, assuming that these projections have first been made, we proceed as follows:

In Fig. 503 join the points i_2 and j_2, also k_2 and l_2 by straight lines, and draw the horizontal center line $o\ o_2$; since we have to deal with a right pyramid, the line $o\ o_2$ will bisect the line $i_2\ j_2$ in the point m; it will also bisect the line $k_2\ l_2$ in the point n.

In Fig. 503*b* draw a vertical line $i_4\ i_6$; the distance between this line and the line $a_4\ a_6$ must be equal to $m\ i_2$ in Fig. 503; again in Fig. 503*b* draw the vertical line $i_5\ i_7$; the distance between this line and the line $a_4\ a_6$ must be equal to $m\ j_2$ (Fig. 503); in this case the lines $i_4\ i_6$ and $i_5\ i_7$ will be at equal distances from $a_4\ a_6$, because $m\ i_2$ and $m\ j_2$ in Fig. 503 are equal to each other.

Through the point a_5 (Fig. 503*a*) draw a horizontal line cutting $a_4\ a_6$ (Fig. 503*b*) in the point a_3; also draw through the point a_7 (Fig. 503*a*) a horizontal line cutting the line $a_4\ a_6$ (Fig. 503*b*) in the point a_9. Again through the points i and i_3 (Fig. 503*a*) draw horizontal lines cutting the line $i_5\ i_7$ in the points i_5 and i_7, and also cutting the line $i_4\ i_6$ in the points i_4 and i_6. Join the points a_3 and i_5 also a_3, i_4; a_9, i_7; and a_9, i_6 by straight lines. The lines $a_3\ i_5$, $i_5\ i_7$, and $i_7\ a_9$ represent the intersections of the pyramid with the lateral face $d_4\ a_4\ d_6\ a_6$ of the prism; and the lines $a_3\ i_4$, $i_4\ i_6$, and $i_6\ a_9$ represent the intersections with the lateral face $a_4\ b_4\ a_6\ b_6$.

Once more, in Fig. 503*b* draw two vertical lines $k_5\ k_7$ and $k_4\ k_6$; the distance of each one of these lines from the line $a_4\ a_6$ must be equal to $n\ k_2$ or $n\ l_2$ (Fig. 503). Through

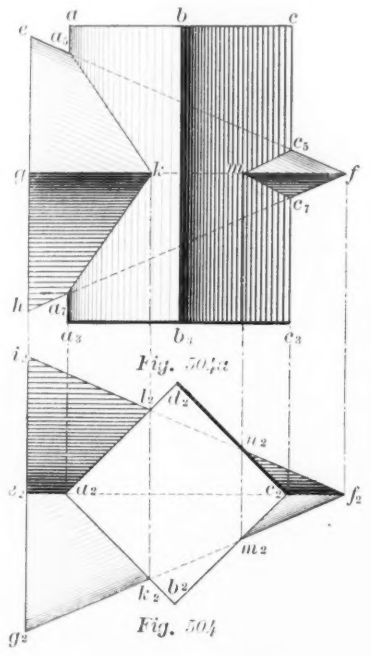


Fig. 503a

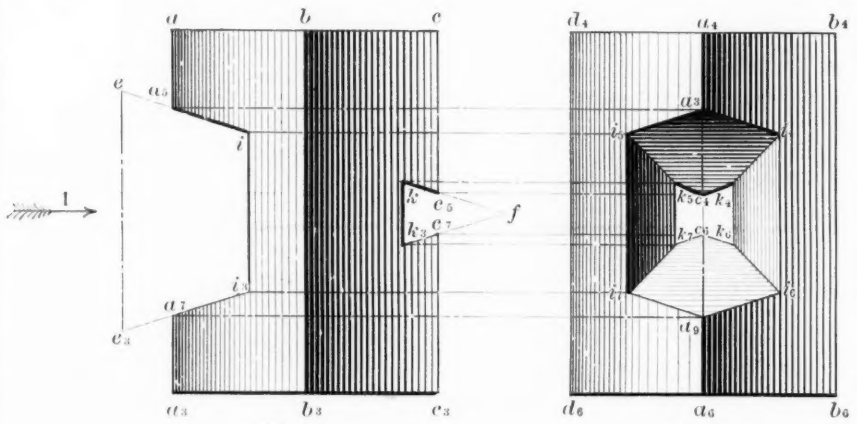


Fig. 503b

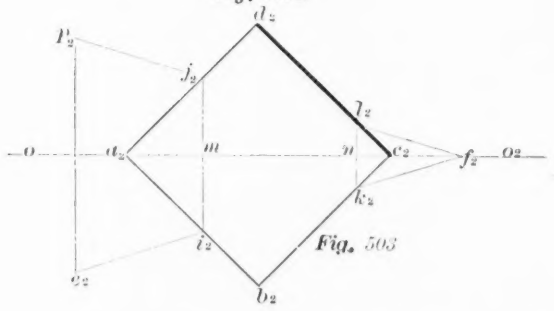


Fig. 503

the points k and k_3, Fig. 503*a*, draw horizontal lines cutting the line $k_5\ k_7$ (Fig. 503*b*), in the points k_5 and k_7, also cutting the line $k_4\ k_6$ in the points k_4 and k_6; again, through the points c_5 and c_7 draw horizontal lines, cutting $a_4\ a_6$ in the points c_4 and c_6. Join the points k_5, c_4; c_4, k_4; k_7, c_6; and c_6, k_6 by straight lines. The lines $k_5\ c_4$, $k_5\ k_7$ and $k_7\ c_6$ are the intersections of the pyramid and the lateral face of the prism which is hidden by the face $d_4\ a_4\ d_6\ a_6$; and the lines $c_4\ k_4$, $k_4\ k_6$ and $k_6\ c_6$ are the intersections of the pyramid with the lateral face of the prism, which is hidden by the face $a_4\ b_4$ $a_6\ b_6$. Join the points i_3, k_5; i_7, k_7; k_6, i_6; and i_4, k_4 by straight lines, and thus complete the vertical projection of the opening through the pyramid.

618. The principles upon which this construction is based are as follows: Take, for instance, the line $i_4\ i_6$ in Fig. 503*b*; the relative position of this line to any of the edges of the prism is established by its horizontal projection i_2 in Fig. 503, and its vertical projection $i\ i_3$ in Fig. 503*a*. In the former figure we see that its distance from $o\ o_2$ is equal to $m\ i_2$, and in Fig. 503*a* we see the distance from the bases of the prism to the extremities of the line $i\ i_3$. Consequently, in Fig. 503*b*, the distance from the line $a_4\ a_6$ to i_4 i_6 is made equal to $m\ i_2$, and the horizontal lines through the points i and i_3 (Fig. 503*a*) determine the extremities of the line $i_4\ i_6$.

Now take the point a_3 in Fig. 503*b*; its relative position to any other line or point of the prism is established by its horizontal projection a_2 (Fig. 503), and its vertical projection a_5 (Fig. 503*a*); hence it follows that the point a_3, in which the horizontal line through a_5 cuts the line $a_4\ a_6$ must be another projection of the same point which is represented by the points a_2 and a_5. Similar remarks apply to the other points and lines of the opening shown in Fig. 503*b*.

Directions.—In the space marked Prob. 95, draw the horizontal and vertical projection of a prism and pyramid, the latter being passed through the prism as shown in Figs. 503 and 503*b*; they are to have the same relative position to the planes of projections as shown in these figures. Find the intersections; also make another view of the prism showing the opening through it as represented in Fig. 503*b*. The bases of the prism are 4½ inches square, and the height of the prism 9 inches. The pyramid is a right pyramid, with a base 5¼ inches square, and its height 7¾ inches. The vertex f of the pyramid projects 2½ inches beyond the edge $c\ c_3$. Use 3-inch scale.

Problem 96.

619. *Intersection of prism with pyramid.*

Let $a\ b\ c$, $a_2\ b_2\ c_2$ in Fig. 504*a* be the vertical, and $a_2\ b_2\ c_2\ d_2$ in Fig. 504 be the horizontal projection of a prism, and $e\ f\ h$ and $i_2\ e_2\ g_2\ f_2$ the vertical and horizontal projections of a right pyramid with a square base passed through the prism; it is required to find their intersections.

The only difference between this problem and the preceding one is that, in the problem before us, the edges $e\ f$ and $h\ f$ of the pyramid are parallel to the vertical plane of projection, and in the former problem none of the edges were parallel to the vertical plane of projection.

These two views also show us that the edges $e\ f$ and $h\ f$ of the pyramid, and the edges $a\ a_3$ and $c\ c_3$ of the prism lie in one plane, which is parallel to the vertical plane of projection; it is important that this condition be kept distinctly in view.

In Fig. 504 we plainly see that the edge $g_2\ f_2$ pierces the lateral face $a_2\ b_2$ in the point k_2. Now, the line $g_2\ f_2$ in Fig. 504, and the line $g\ f$ in Fig. 504*a* represent one and the same edge of the pyramid; hence, the vertical projection of the point k_2 must lie in the line $g\ f$; therefore, through k_2 draw a vertical line, cutting $g\ f$ in the point k, which is the vertical projection of the point in which the edge $g\ f$ pierces the lateral face $a\ b\ a_3\ b_3$ of the prism. For similar reasons draw a vertical line through the point m_2 (Fig. 504), cutting the line $g\ f$ in the point m, which is the vertical projection of the point in which the edge $g\ f$ pierces the lateral face $b\ c\ b_3\ c_3$ of the prism.

Now, since the edges $e\ f$, $h\ f$, $a\ a_3$ and $c\ c_3$ lie in the same plane, it is obvious that the points a_5 and c_5 are the points in which the edge $e\ f$ of the pyramid cuts the edges $a\ a_3$ and $c\ c_3$ of the prism; also the points a_7 and c_7 are the points in which the edge $h\ f$ cuts the edges $a\ a_3$ and $c\ c_3$. Hence join the points a_5, k; k, a_7; c_5, m; m, c_7, by straight lines; these will be the lines in which the pyramid intersects the lateral faces of the prism.

620. When the pyramid is removed the prism will have the appearance as shown by the shaded portion of Fig. 505*a*.

Fig. 505*b* represents the prism with the axis of the opening perpendicular to the vertical plane of projection. To find the projection of this opening, we shall require the projections shown in Figs. 505 and 505*a*; assuming these to have been drawn, and remembering that the lines which are designated by similar letters represent one and the same edge of the pyramid or prism in all the different views, we proceed as follows:

Through the points a_5 and a_7, in Fig. 505*a*, draw horizontal lines cutting the line $a_4\ a_6$ (Fig. 505*b*) in the points a_3, a_9. Prolong $g\ f$ (Fig. 505*a*) towards k_4, in Fig. 505*b*; on this line lay off the points k_4 and k_6, and make the distance from each one of these points to the line $a_4\ a_6$ equal either to $o\ k_2$ or $o\ l_2$ (Fig. 505); we say either equal to $o\ k_2$ or $o\ l_2$ because these are equal to each other. Join the points a_3, k_6; k_6, a_9; a_9, k_4 and k_4, a_3, by straight lines. The lines $a_3\ k_6$ and $k_6\ a_9$ will be the lines of intersection of the pyramid with the face $a_4\ d_4\ a_6\ d_6$ of the prism, and the lines $a_3\ k_4$, $k_4\ a_9$ will be the lines of intersections of the pyramid with the face $a_4\ b_4\ a_6\ b_6$. Again, on the line k_6 k_4 lay off two points, m_2 and m_6, and make the distance from each one of these points to the line $a_4\ a_6$ equal to $m_2\ p$ or $n_2\ p$ (Fig. 505). Join the points c_4, m_6; m_6, c_6; c_6, m_2, and m_2, c_4 by straight lines. The lines $c_4\ m_6$ and $m_6\ c_6$ are the lines in which the pyramid intersects the lateral face of the prism, hidden by the face $d_4\ a_4\ d_6\ a_6$; and

the lines $c_4\ m_4$, $m_4\ c_6$ are the lines in which the pyramid intersects the lateral face of the prism hidden by the face $a_6\ b_4\ a_6\ b_6$. Lastly, join the points a_8, c_4; m_6, k_6; c_6, a_9, and m_4, k_4 by straight lines, and thus complete the vertical projection of the opening in the pyramid.

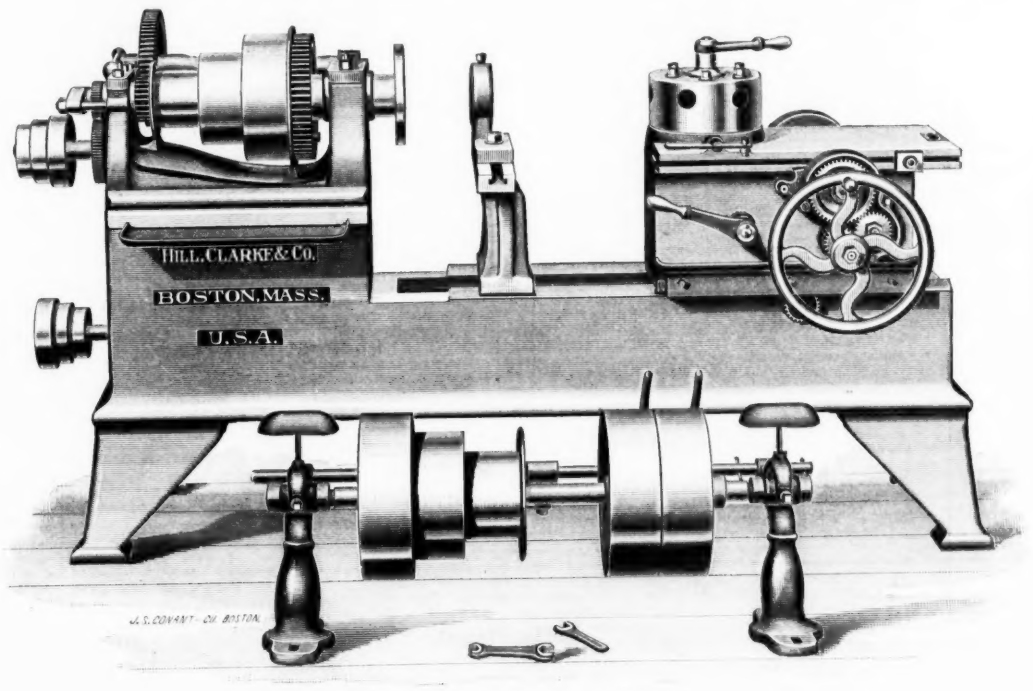
621. The principles upon which this construction are based are easily seen, for we have simply found, in Fig. 505*b*, a number of points whose relative positions in space are established in Figs. 505 and 505*a*. Thus, for instance, the point a_8 in Fig. 505*b* we know, must lie in the line $a_4\ a_6$, and its distance above the line $k_6\ k_4$ must be equal to the distance of the point a_5 above the line $g\ f$; hence, through a_5 we have drawn a horizontal line, cutting $a_4\ a_6$ in the point a_8. By so doing we make the distance from the point a_8 to the line $k_6\ k_4$ equal to that between a_5 and the line $g\ f$. Again, the point k in Fig. 505*a* and k_2 in Fig. 505, are the projections of another point on the prism, and this point is represented in Fig. 505*b* by k_4; hence the distance from the point k_4 to the line $a_4\ a_6$ must be equal to $o\ k_2$, in Fig. 505, and it must also lie in a horizontal line through the point k, in Fig. 505*a*. The line joining the points a_8 and k_4 must be the vertical projection of the line which, in Fig. 505*a*, is represented by the line $a_5\ k$. Similar remarks apply to the other points and lines in Fig. 505*b*.

Directions.—In the space marked Prob. 96 draw the vertical and horizontal projections of a prism and pyramid, the latter being passed through the former; they are to have the same relative position to the planes of projections, as shown in Figs. 505*a* and 505. The dimensions are to be the same as given in the directions in Art. 618.

Use 3-inch scale.

Thirty-six Inch Chucking Lathe.

With this we present an illustration of a turret head chucking machine, built by Hill, Clarke & Co., Boston, Mass. It will swing 36″ over the bed, and the turret has six holes 1⅞″ diameter for the reception of the various boring tools and reamers which may be required. The turret slide has an automatic feed of 27″, and has a stop which can be set to throw out the feed at any desired point. The turret is revolved by hand, and is released by withdrawing stop lever at the side below the turret.



THIRTY-SIX INCH CHUCKING LATHE.

The block which supports the turret slide is clamped to the bed by means of the lever shown at the side, and is provided with a rack and pinion to facilitate moving it along the bed when its position is to be changed. The back gears give ample power for the heaviest work, and the belt is 4″ wide. The spindle has a hole through it 1¼″ diameter. A chucking rest is provided with each machine, which is bored to receive bushings to support long cutter bars. The spindle is furnished with the small face-plate shown, to which can be fitted a chuck of any desired construction, either by the makers or by the purchaser. The countershaft has tight and loose pulleys 14″ diameter, 4″ face, and should run 125 revolutions. The total length of the bed is 6½ feet, and the weight of the machine about 3,000 pounds.

The *Commercial Advertiser* concludes there is a revival in the building of clipper ships, and has interviewed shipping men, who express the opinion that the cheap carrying trade of the near future will be done by such vessels. A shipping merchant on South street said: "Here are a dozen big ships that have been sailing for twenty years; yes, and some of them for thirty years and more, yet they are to-day almost as good as the year they made their first trip around the Horn. Where is there a steamship that has been running ten years, and can still make as good a voyage as she made when one year old?"

Something About the Paris Exposition.

(*Correspondence.*)

As requested, I made an attempt while in Paris to write out my impressions about the Exposition, and note some of the individual exhibits that were most interesting to me. The attempt, so far as the writing went, ended with the first paragraph. Usually I should have considered it much safer to put the paragraph in the fire than in the AMERICAN MACHINIST; but as I fancy the statements made in your "editorial correspondence" have brought your readers partly up to a realizing sense of our condition, I will venture to quote the paragraph:

"The first thought that comes to mind is: What can one say that will do any good? To describe and extol the display made by our own country might flatter our national pride, and help to cultivate the worst and most to be deplored element in the American disposition—conceit—whereas, to tell the facts as they exist will be to tell that which will not be believed or will lead to ridicule, or both. In fact as mechanics, as designers, as engineers, as a nation, we are too selfish, too egotistical, too illiberal, too narrow to do things on a broad gauge, and we lack the genius to do it, if we had the disposition. This being the exact reverse in every particular to the opinion we have of ourselves as a nation, is it possible to say anything that will have any useful effect? But how any unbiased man, seeing this marvelous exhibition—the wonderful buildings, the engineering achievements, the great display of art, the taste with which everything is done, can come to any other conclusion than that we have a world to learn, and little to show, is more than I can comprehend."

To find such a place as the Champ de Mars, a field one-quarter of a mile wide by a mile in length, within the walls of a city of two million people, and available for exhibition purposes, shows that some one who had the power, years ago, had also a broad conception of what would be wanted some day for military or other purpose. The evidence of broad and liberal ideas is visible all through Paris, as it is in the Exposition.

Broad, well-paved, and well kept streets, shady avenues, parks, open courts where quiet dwelling places front, in place of our filthy back yards. Noble buildings, a union of feeling where all join to make the whole square to one harmonious building, rather than each man for himself, and so getting a dozen different kinds of buildings on every block.

The above might well form the text for many a useful sermon—but the AMERICAN MACHINIST is not the place for sermons. The same difference between the French and American mind and character, the union of ideas and spirit in the one and the individual selfishness—the great "I am" of each individual, in the other—is as marked in the exhibition as in the cities of Paris and New York, or any other American town.

Every American has his own display in his own way, using his own taste, good or bad, or none, as he best sees fit, while among the French, large numbers join together, put the matter in the hands of a good designer, and form long avenues of exhibits, in one harmonious whole, each with an equal chance, with the advantage of an attractive display in an attractive section.

The same thing is done by the Swiss watch makers. Some fifty or more all joined to make one grand display, each with a case of his own, but all in the same case with his neighbor. Without this union, the work of a whole section cannot be put in the hands of a single designer, and in no other way can a harmonious whole be obtained.

Americans do not do this, and nine-tenths of us will say we do not want to. The beauty of the great Exhibition is not confined to the sections, but is everywhere visible in mass and detail. The manner in which the iron work is changed from the common lattice bridge construction to a thing of beauty, is something never accomplished, if ever attempted, before.

Painting the iron a modest blue, in place of red or black, and filling the triangular and rectangular open spaces with cream-colored ornamented terra cotta panels, was how it was done; but each post, arch, and panel and ornament, was a study of its own. How many of those who visit the Exhibition stop to think, that each point, piece and panel, each piece of pottery and painting, everything about the building, and in it, was the embodiment of some man's best thought, carved out by workmen, all striving to do the best of their lives, and to outdo all others? The American conception of how to outdo others is a peculiar one. The idea that if one American flag is a nice thing, two American flags are just so much nicer, is I believe a characteristic Yankee notion entertained by no other nationality, and this one idea seems to have prevailed rather extensively among the commissioners and exhibitors in the American section at Paris. Perhaps I may not possess the spirit of high art; possibly I lack patriotism; but I question if any unbiased mind can look upon the flaunting of the stars and stripes so conspicuously as otherwise than in bad taste. The idea with us is, that to outdo others we must simply get it bigger, and the thing is done, regardless as to who originated the thing or the perfection of its execution. Such an idea as this seems to prevail, and has already been proposed. That is, all we have to do to beat the Paris Exposition, is to build a tower eleven hundred feet high. Such was the spirit that conceived and adopted the plan of the Washington monument—such is the spirit that boasts of our great country—our high mountains and great rivers, the Niagara and the Yosemite, and yet what right have we to boast of them that are none of our making? I believe I do not under-estimate the sorrowing thoughts these remarks will bring into the minds of some, and the scorn and indignation it will arouse in others. But I believe them to be truths. If they are truths, we cannot but be the better off by knowing them, and he who attempts to do the people of his own country some good, does a patriotic thing, though he may be no patriot. JOHN E. SWEET.

An act of bravery performed during the recent naval review has scarcely met with the notice it deserved. An officer was standing by the wheel of the sailing brig of the "Inflexible," when suddenly a gust of wind sent the boom of the mainsail round, and swept him into the sea. A strong tide was running past, and the man was carried along past the "Teutonic"—for which the brig of the "Inflexible" had been making. Mr. McKinstry, first officer of the "Teutonic," was standing on the turtle back of the ship. Throwing off his coat, he leaped into the sea, a distance of nearly thirty feet, and succeeded in reaching the drowning man—half stunned by the blow he had received—and keeping him afloat until boats launched simultaneously from the brig and from the steamship picked them up. This is the second life that Mr. McKinstry has saved within a year. He already holds a Humane Society's medal; and to this medal a clasp should now be added.—*London Life.*

A "reading lamp," which is being put in use on the Southeastern Railway, in England, is thus described: "It is on the principle of the 'put a penny in the slot' automatic machines. The apparatus is situated immediately over the passenger's head, and under the rack, and is contained in a small box—5 inches by 3 inches. The light is of five candle-power, and is obtained by the introduction of a penny at the top of the box, and by the subsequent pressure of a knob, and will last for half an hour, extinguishing itself at the end of that time automatically. If the light be required for an indefinite period, a penny every half hour will suffice. The light can be extinguished at any moment by means of a second button provided for the purpose. This invention will add greatly to the comfort of passengers during night journeys."

According to *Indian Engineering*, railway travel in India must be about the safest thing in the world, as the following official figures will show:

"The mean mileage open, train mileage run, and number of passengers in millions was 14,379, 50,109,119, and 103.166 respectively during 1888, against 13,578, 15,779,096, and 95.75 respectively during 1887. The number of train accidents per 1,000 train miles was 0.06. There were two passengers killed from causes beyond their own control; being an average of one per 51.58 millions of passengers traveling; twenty-six passengers were injured, or an average of one per four millions. From the total number killed and injured, viz., twenty-eight, it would appear that an average of 155.3 millions of miles was traveled for each casualty."

LETTERS FROM PRACTICAL MEN.

Large Rifling Machines.

Editor American Machinist:

In your August 29 issue, under "Shop Notes," you stated that the machines used by the Pratt & Whitney Co., for rifling the six-pound Hotchkiss guns, are the largest and finest ever built, especially for rifling.

Two years ago I saw a machine at the Woolwich Arsenal, in England, at work rifling a gun that was fully 22 feet long, and about 10″ bore. Now it seems rather odd that it should take a larger machine to rifle a

gun 90″ long and 2.24″ bore, than it did the one I describe.

I don't know if the machine I saw was built especially for rifling or not, but I don't know of anything else it could be used for.

I saw another gun there that was over 40 feet long, and 16½″ bore. It was made by Sir Wm. Armstrong. This was also rifled with about 75 or 80 grooves. I was told that this gun was not rifled by Armstrong, but it must have taken a very large machine to do the work. CHAS. A. TRASK.

[Of course we were well aware that much larger guns than those described by us had been rifled even in this country, but not by machines constructed exclusively for rifling. The machine made by Pratt & Whitney is much larger than the size of the gun described would indicate, however, for it was built to rifle 33 pound guns of the same type.]

Making Gears—Cold Shut.

Editor American Machinist:

I would like to say a few words more regarding the moulding and casting of gears, both spur and bevel. It often happens that the teeth of spur gears that have webs on the arms and rim cause cold shut; and it will be noticed that the cold shut occurs opposite the lower portion of the web. The cause of the cold shut and its persistency in locating itself in the same spot, is that, when the mould is filling, when metal gets to the level of the web on arms, its upward tendency is retarded, and the narrow space between the sand teeth freezes or congeals, a thin film is formed, and when the metal gets high enough in other parts of the mould, it flows over the congealed teeth, and the result is a cold shut. It will often look as though dry parting sand has got in the tooth, and lodged there. That is caused by the heat drying and the steam sifting out fine particles of sand on the thin film that congeals, as before mentioned. This can be avoided by using very weak facing on the upper part of teeth and by good large gates and pouring basin, and filling the mould as quickly as possible and not wash parts of the hub away. As I have before said, gears more than 18 inches diameter should not be rammed up on a follow board and rolled over, as it is simply an impossibility to obtain true gears, or anywhere near true, by that process. They should be bedded in, both spur and bevel gears.

To bed in a bevel gear requires, to my mind, as neat, close and accurate work, if done right, as is to be found in green sand moulding. The pattern should be leveled up true, either in a drag or in a place prepared in the floor; weight it down well to prevent springing on the wedges or blockings. It is then tucked up firmly and evenly around the rim with riddled heap sand; no other part need to be tucked at this operation. The pattern is then staked and drawn off this bed, then cut off all teeth evenly down to the root of sand tooth. Turn pattern with teeth up and brush clean, and tuck them up in the pattern with facing, and shave them off even with the face of teeth in the pattern, being careful not to jar the pattern or suffer it to receive knocks while tucking up the teeth. Then riddle with fine sieve (say No. 8), facing over the sand bed first made in the floor or flask. This should be done with care and judgment, so as to distribute the facing sand evenly on the bed; then turn the pattern over and place in bed, and gently settle it with light taps of hammer. In this connection it may be in order to say that there is not much fear of getting teeth in a bevel gear too hard; if it will draw, the iron will lay peacefully in and around the sand teeth, if very firm.

Speaking of cold shuts, I was once shopmate with some work, a number of years ago, one piece of which was as per sketch, Fig. 2. As you may see, it was the base of a machine that had a broad plate bottom, and run out as per section through *A*. Every one that was made would have a cold shut at *B B*. I inquired of the foreman what he supposed was the cause; he answered that the cores scabbed. "Don't you see the fine white sand in there?" "Yes, I see the fine white sand, but that don't come from the core; that is sifted in on the film of metal that is formed between those walls, while the plate over main body is being covered and filled."

The way we stopped this trouble in this particular case was to cast on a piece, as shown by dotted lines, and let the wrinkle come out in that, and then chip the lug off—always placing the center of the lug on a line with the top of main body of casting, as shown at *B B*—and we never failed to catch the little joker. L. C. JEWETT.

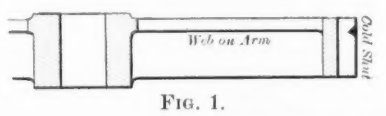


FIG. 1.

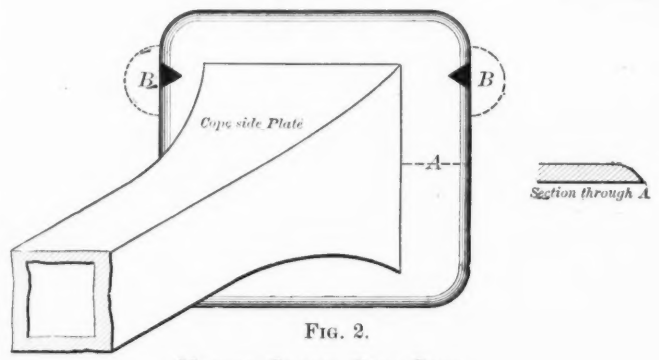


FIG. 2.

MAKING GEARS—COLD SHUT.

Shop Facilities.

BY A SHOPMAN.

It is a matter of frequent observation, that workshops, fitted up with the very best of tools, and in every way thoroughly equipped for rapidly performing work when once in hand, are nevertheless strangely and unaccountably deficient in means for lifting and moving work from one machine to another.

For example, a piece of work is partially completed and set aside for a more urgent order. If it is, say, a girder to be removed from the riveting machine, it will be laboriously rolled away, with much breakage of planks and packings, and not a little profanity, and be deposited in the yard. Whilst there, some occasion calls for it to be turned over. If of comparatively small size, probably all the available men in the shop are called upon to raise it and turn it by the exertion of sheer brute strength, and with consequent disturbance of all other work on hand.

If too heavy for this, jacks will be employed with props and packings, and some three men perhaps spend an hour or two in the undertaking.

All this waste of time and labor, together with the accompanying annoyance, might be avoided by the use of a yard crane, either of the jib or traveler class, or a combination of the two. The gantry for a traveler is by no means necessarily expensive, a simply stayed stout framing of rough timber being all that is necessary.

The crane itself, too, need not in most shops be of expensive or complicated type, a simple double purchase hand-crab being more than sufficient in ordinary cases. The saving which might thus be effected in the cost of moving, turning over, and shipping onto cars is immense. How frequent it is that a girder or boiler can only be taken from the maker's yard and placed upon a car by means of the jack and inclined plane, assisted perhaps by a hand-tackling—in fact, by the very elementary forms of the mechanical appliances which are found engraved in a small old-fashioned treatise on mechanics. This is not as it should be, and I venture to say that the cost of a given heavy piece of work is often more than doubled by the lack of moving facilities. The inclined plane in its simple form is doubtless an excellent contrivance, but as used in practice for raising loads, is wholly unsuitable.

The screw is an excellent appliance, but the screw-jack cannot compete with the overhead crane as a means of hoisting more than an inch or two. It is not the inherent fault of the means employed, but the wrong choice of means, which condemns the practice to which I refer. I would strongly urge the employment of lifting tackle of convenient sort to cheapen the cost of production in the machine shop. The use of power should not stop with the yard or even with the heavy machine shop. It should extend to every tool in which work is to be done of greater weight than one man can lift into place, and would save many a hard knock upon parts of the machine which are damaged by the rough handling they receive at present. Where hydraulic power can be used with freedom from freezing in winter, such tool cranes may be very easily made of the type adopted in the Forth Bridge works for example, where for short lifts, light wrought-iron jib cranes are employed all about the place for lifts of a few feet only, the whole frame of the jib rising with the work, and swinging round a circle of a few feet. Whatever be the form employed, it is certain that lifting by power must be far cheaper than by direct manual strength; for against the cost of the crane is to be set the extra return from the machine served by it, apart from the greater gain of the machinist's time; often, too, one crane may serve two or more machines. Small cranes are in many respects to be preferred to one large traveler, whose duty should be to convey work through long distances rather than to serve to machines. The necessary cumbrousness of a universal traveler is against its use in fixing work in the machine. Some recent experiences of the loss attending a lack of crane-power has led the writer to put these few remarks on paper.

Starvation Amid Plenty.

From Spring Valley, Ills., comes a story of suffering and misery which can hardly fail to stir the hearts of the people all over the land; a story which rests upon the authority of Henry D. Lloyd, formerly on the editorial staff of one of the Chicago morning papers. He says:

"There is greater need than ever of help for the starving men, women and children of Spring Valley in this State. There are thousands of sufferers from want of food, clothing, medicine and sympathy. Most of these sufferers are children, and most of the children are little ones.

"I have just returned from Spring Valley. There, in this great and prosperous State, and in the midst of harvest-laden farms and rich cities, the visitor will see a cemetery of the living. Instead of the light of health, there shines in the eyes of the men and women the phosphorescence of decaying strength, and the children, fatally weakened by want, are dying of diphtheria."

It seems these miners had been making, according to their own statements, $30 per month, and according to the statement of an official of the mining company, $43 a month. This at a price of 90 cents a ton. Last winter about 1,000 of them were thrown out of work by an order closing part of the mine, and those who remained at work, knowing that this in the dead of winter meant starvation to their comrades and those dependent upon them, divided their work with them, so that all managed to exist after a fashion until spring, when, without previous notice of any kind, they were all ordered to leave the mines, which were closed. They remained in idleness and suffering, and recently were offered 55 cents instead of 90 cents per ton, which they knew meant starvation, only in a less degree or slower than that which they suffered when idle. These men are not strikers, and did not lose their work by a strike, and the fact that they endure such suffering as is portrayed by Mr. Lloyd, is an overwhelming answer for those who claim that the company offers them living wages, and that, if they do not choose to accept what is offered them, they are privileged to go elsewhere and work. They are evidently not privileged to go elsewhere and work, or they would certainly do so; and as Mr. Lloyd says:

"That a community of 5,000 persons in the State of Illinois is in the throes of starvation, and has been so for months, is a public scandal and a catastrophe which would seem to demand as prompt and thorough action from the government and the people as the Johnstown disaster."

What are no doubt the most powerful rolling mill engines in the world are the reversing engines that Messrs. Galloways have just made for Palmer's Shipbuilding Company, for driving a 44-inch train for making angle irons, H-irons, beams, etc. The cylinders of the engines are 56 inches diameter by 6 foot stroke, and are fitted with Joy's valve gear. The steam pistons are of steel, and the crank-shaft is built up of mild Siemens-Martin steel, the forgings of which weighed over 41 tons before being machined. The finished shaft has journals 21 inches diameter, and is of a total length of 23 feet 6 inches. To meet the requirements of Joy's valve gear, the piston valve chests have been arranged on the upper side of cylinder, which enables the cylinders to be similar in every respect, and special provision is made for expelling the water, which may be carried over in the form of wet steam. The engines are of massive construction, and the whole framing is so arranged as to receive the strains in the most direct manner possible. The engines are similar, with the exception of the adoption of Joy's valve gear, and also with the further exception that they are of larger size, to Galloway's engines previously made and supplied to many English, Continental and American steel works. They are constructed for a working pressure of 100 pounds to the square inch, and, when running against suitable resistance, would be fully equal to developing over 10,000 horse-power. The weight of the engines is nearly 300 tons. In the Antwerp Exhibition there was exhibited, in model, a very large rolling mill engine, said to be of 11,000 estimated indicated horse-power; but the engines above described are believed to be the most powerful of any used in rolling mills.—*English Mechanic.*

Just at present there are several schemes for rapid locomotion being pushed. There is the electric suction system, from which a speed up to 400 miles an hour is expected by its advocates; then there is the bicycle locomotive that is good for a hundred miles or more, to say nothing of the engine that slides along on a film of water at almost any phenomenal speed. If the dreams of recent inventors in locomotion are realized, the ordinary locomotive will soon be a slow coach. It is safe, however, to await further developments. There is a material difference between a model that would do so and so but for some easily-remedied defect, and a comprehensive system that does do as advertised, in practical use.

In the torpedo boat which the Herreshoffs are building for the United States government, the Thornycroft boiler will be used, the steam pressure required being 250 pounds. The engines are quadruple expansion, and are expected to develop 1,600 horse-power, and to make 300 revolutions per minute. The guaranteed speed is 24 knots, with a bonus for every quarter of a knot in excess of this. There is little doubt that there will be a handsome sum coming to the builders in the way of a bonus.

From all accounts the demand for skilled labor in England and Scotland is steadily increasing, and is accompanied with a material increase in wages. This is particularly true of shipbuilding, and in those trades that furnish material that enters into the construction of ships, although the advance in the steam engine and machine tool trade is scarcely less noticeable. Altogether in the trades there are very few skilled workmen idle.

New York vs. Chicago.

The perennial base-ball controversy raging between these two cities has lately been thrown into insignificance, by reason of the dispute as to which shall have the honor and privilege of celebrating the 400th anniversary of the discovery of America by Columbus. That two fairs of the right kind can be held simultaneously in two different cities in commemoration of that event, seems clearly out of the question, and the honor of the country at large is concerned, equally with that of the two cities referred to, in having the right kind of a celebration or none. If the city of New York, as the present metropolis of the Western continent, really wants this privilege, and gives substantial evidence of her desire, it would seem on many accounts the fittest place in the country for the purpose. But it is very largely a question of cash, and if New York does not "put up," Chicago cannot, with any grace, be asked to "shut up."

We think, however, that our bustling Western neighbor can well afford, after putting her metropolitan rival to the proof, to stay her hand for another very timely and perhaps equally worthy occasion, coming eight years later.

The year 1900, beginning as it does the twentieth century of the world's progress, as we now reckon time, would seem to be a year deserving celebration, and we know of no city East or West, which would more fitly typify the spirit of such an occasion than Chicago, which, as we believe, was not even in existence as a city when the record-book of the present century was opened.

The Great London Strike.

For some weeks there has been going on in London a strike of workingmen; a strike which, for magnitude, we know little of in this country. The beginning of this strike was the intention of the dock laborers to share, to some small extent, in the general prosperity that appears to have overtaken England. Or, to put it another way, these dock laborers thought the season of large business profits in England a good time to secure for themselves a little more in the way of the necessities of life—a very natural feeling indeed under the circumstances. Their petition for better pay was refused by the dock companies, and in the end 150,000 men—dock laborers and others—went on strike.

From the beginning it has been apparent that fair-minded Englishmen sympathized with the strikers, and when that is the case in England it is reasonably certain that there is justice on their side. It takes a good deal in England to create much sympathy between classes.

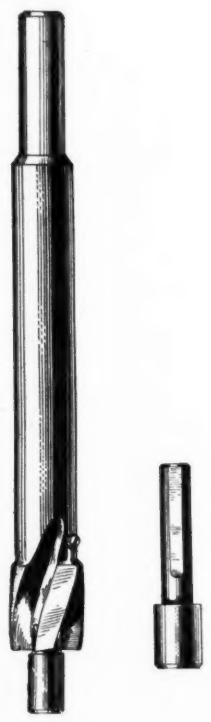
A certain John Burns, it appears, took charge of this strike. We do not know anything about John Burns, except that, so far as can be seen, he has managed the affairs of the strikers with great good judgment. He appears to have controlled these 150,000 hungry men—with hungry families at home—in such a way as to keep them from violence, and to hold for them the good will of the public—a very important thing to do. He undoubtedly has done good work, both for the strikers and for the people.

But with all praise for John Burns, what shall be said for the men who could be thus restrained? They are men who are called ignorant; men who are said to be dominated by their passions. But their actions, so far, are such as to put to shame such opinions. One man cannot control 150,000 men who are altogether, or very, bad. It appears as if these men had shown a good deal more sense than their employers, who have fought against paying decent wages, and fought for a horde of middlemen who take a liberal percentage of what little the dock companies pay as wages.

Whether the strikers gain or lose in their fight, every one must admire the bravery with which—without money, and hungry—they contend for what they think is right. And every one will admire the respect they have for property and the rights of others.

Clough's Counterbore.

Accompanying this is an engraving of a counterbore for machinists' use, made by R. M. Clough, Meriden, Conn. One of the objects sought is to do away with the trouble and expense arising from the fact that so many different counterbores have usually to be provided in order to meet all the requirements of sizes of tit and bore. This is done by making the tit separate, providing it with a long, straight shank, and fastening with a small set-screw. This very much reduces the number of counterbores which it is necessary to have, because the tits are readily changed, and one of any desired size may be placed in any counterbore. This construction also greatly facilitates the operation of grinding, since, when the tit is removed, it is comparatively easy to get at the cutting



edges with an emery wheel. They are made with either straight or taper shanks, and of a length equal to twist drills of corresponding sizes. With the tit removed this makes a very good tool for squaring the bottom of a hole. They are made of a good quality of steel, hardened and accurately ground to standard sizes.

Notes on Superheated Steam.

BY RICHARD H. BUEL.

Saturated steam has a fixed temperature and volume, corresponding to each definite pressure; but should the temperature be raised, increasing the pressure if the volume is maintained constant, increasing the volume if the pressure is maintained constant, and increasing both the pressure and volume if these two elements are allowed to vary—the steam to which the additional temperature is imparted is called *superheated steam*.

Steam, in contact with water, does not become superheated if the heat is applied through the medium of the water, but the heat must be imparted to the portion of the boiler or the separate receptacle containing the steam.

On first superheating steam above the temperature due to the pressure of saturated steam, the increase of pressure or volume is quite rapid, gradually diminishing until a temperature is reached at which the steam becomes gaseous, that is to say, on being heated above the temperature of gaseity, it expands in accordance with the laws governing perfect gases—an increase in temperature of each degree Fahrenheit causing an expansion of volume, if the pressure is maintained constant, of

$$1/493.2 = 0.0020276,$$

or a like increase of pressure if the volume is maintained constant.

In ordinary practice, steam is superheated at constant pressure, either by adding superheating surface to a boiler, or by placing an independent superheater in the flue of the boiler or of a separate furnace. In order to transform saturated steam into a perfect gas, a considerable elevation of temperature (increasing with increased pressure of the saturated steam) is required; and in many cases where superheated steam is used, the temperature of superheat is less than the temperature of gaseity. For all such cases, as has already been remarked, the rate of expansion is variable and greater than the rate for gaseous steam.

The most extended experiments on superheated steam have been made by Professor Hirn, and Professor Zeuner has deduced formulas which express the results of these experiments with considerable accuracy. Professor Zeuner's rules are as follows:

1. To find the volume—in cubic feet—per pound of steam superheated at constant pressure to any temperature between the temperatures of saturation and gaseity (temperatures taken in Fahrenheit degrees, and absolute pressures in pounds per square inch).

Add 461.2° to the given temperature, multiply the sum by 0.644, subtract 23.542 times the fourth root of the given pressure, and divide the difference by the given pressure.

2. To find the total heat of evaporation—in British thermal units—required to convert one pound of pure water, at 32° Fahrenheit, into steam superheated to any temperature between the temperatures of saturation and gaseity, under constant pressure.

Subtract 32° from the temperature of superheat, diminish this difference by 20.4303 times the fourth root of the pressure, multiply the remainder by 0.4805 and add 1,075 to the product.

Example.—What is the volume of a pound of steam when superheated to the temperature of 375° Fahrenheit, under a constant pressure of 100 pounds per square inch; and what is the total heat above 32°?

For the volume:

$(461.2 + 375) \times 0.644$ 538.5

$23.542 \times \sqrt[4]{100}$ 74.4

Difference 464.1

Divide by 100

Volume 4 641

cubic feet per pound.

For the total heat:

$375 - 32$ 343

$20.403 \times \sqrt[4]{100}$ 64.5

Difference 278.5

Multiply by 0.4805

Product 133 8

Add 1,075

Total heat 1,208.8

British thermal units.

Professor Rankine has demonstrated that the amount of heat—in British thermal units above 32°—required to transform a pound of pure water into gaseous steam, at any given pressure, is calculated as follows:

Find the temperature of saturated steam corresponding to the given pressure, subtract 32° from this temperature, multiply the difference by 0.475, and add 1,092 to the product.

The temperature of gaseity can be calculated from one of Professor Zeuner's rules in the following manner:

Add together the temperature of saturated steam corresponding to the given pressure—32°—and 20.403 times the fourth root of the given pressure.

Example.—What is the total heat above 32°, required to generate a pound of gaseous steam under a constant pressure of 100 pounds per square inch; and what is the temperature of gaseity?

The temperature of saturated steam corresponding to a pressure of 100 pounds per square inch, is 327°.4.

For the total heat:

$1,092 + 0.475 \times (327.4 - 32) = 1,232.3$

B. T. U.

For the temperature of gaseity:

$327°.4 + 32° + 20.403 \times \sqrt[4]{100} = 423°,9.$

If the weight of a cubic foot of superheated steam at any given temperature and pressure is required, it can be found by taking the reciprocal of the volume. For example, steam superheated to 375° at the pressure of 100 pounds per square inch has a volume of 4.641 cubic feet per pound, as already calculated; and its weight is

$$\frac{1}{4.641} = 0.21547 \text{ pound per cubic foot.}$$

The preceding rules cover all the data generally required for cases of superheating up to the temperature of gaseity. After reaching this temperature, if the steam is superheated to a higher temperature, under constant pressure, the expansion takes place at the rate of $\frac{1}{493.2}$ of the volume at the temperature of gaseity, for each increase in temperature of 1° above the temperature of gaseity; and the amount of heat required to increase the temperature of gaseous steam above the temperature of gaseity is at the rate 0.475 B. T. U. for each degree of superheat.

In the shops of Geo. Richards & Co., Broadheath, England, the holes for centers in the spindles of lathes of a certain class are all made standard size, so that centers are interchangeable, all the lathes being grouped in as few classes as is practicable. When a center in use is sufficiently worn, or is broke, instead of repairing it the lathesman takes it to the tool room, and gets another. The dilapidated centers are put in shape in the tool room, being held in a standard hole in a piece that can be attached absolutely true to the face plate of a grinding machine. It is the work of a boy to grind the centers, and a stock of each size is kept on hand.

The *Sanitary Engineer and Building Record* calls timely attention to the lack of ventilation in school-houses. It says:

"Many of the older school buildings in New York and Brooklyn, and surrounding cities, have not a particle of ventilation. Some of them, truly, have registers in the walls, but these registers are, as a general thing, the most barefaced shams, little or no air passing through them, one way or the other. But even if the air through them had a velocity of three feet per second, it would not supply more than one-tenth the amount necessary."

With a slight change in the wording, this would apply to a good many shops and factories in the United States.

A recent French invention consists in effecting the deposit of a coating of aluminum by the direct contact, with the iron or other metal suitably prepared, of aluminiferous vapors resulting from the decomposition or volatilization, by heat, of salts of aluminum. The apparatus whereby the operation can be continuously repeated on a commercial scale, comprises the employment of muffles or closed chambers, whereby the presence of air or of free or active oxygen is excluded during the operation.

William Hassman has been appointed master mechanic of the Huntington and Cincinnati division of the Chesapeake & Ohio Railway, succeeding F. A. Given, who has been transferred to the Richmond and James River division.

A gigantic project in France is to build a maritime canal through the center of the country, so that, by utilizing rivers, cruisers could pass from the English Channel to the Mediterranean Sea.

Pittsburgh iron manufacturers believe they can treat sheet-iron with aluminum, and so make it equal to the Russian product, so far as freedom from oxidation goes.

Experiments, said to be successful, have been made in Germany, with torpedoes of paper. They are said to be strong, an
the same time elastic.

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A Bad Practice.

There is a practice which the various local associations of workingmen are drifting into, which, if persisted in, we think will inevitably work great injury to them, and which we consider it our duty to warn them against. We refer to the habit of sending tickets for entertainments, gotten up by the local divisions, to manufacturers who are at such a distance as to prevent their attendance, with the request that they remit the price of the tickets, in return for which the impression is conveyed, either directly or by implication, that the influence of the members will be exerted in favor of the goods of the manufacturer addressed. There is scarcely a manufacturer of any prominence, whose products go into the hands of men belonging to certain associations, that does not receive many such tickets in the course of the year, and the purchase of them, together with other and similar demands, has become in many cases a serious matter.

A case recently came under our notice, in which a local council of engineers in this State, through its chief officer, sent a letter to a prominent manufacturer in New England, enclosing a lot of tickets to an entertainment, and stating that if the tickets were paid for the influence of the members would be exerted in favor of his goods. The tickets were returned, with a letter in which some allusion was made to "cheek," but offering—if the council was in need of reading matter—to send them books to the value of $5.00.

A letter was received in reply from the secretary of the council, in which he stated that the offer had been accepted at a regular meeting, specifying the publications they desired, and saying: "We will use our influence in your behalf."

It is one of the duties devolving upon engineers and other mechanics who must be consulted with regard to the purchase of machinery and supplies, to keep themselves reasonably well posted as to the comparative merits and peculiar adaptabilities of the various kinds of goods manufactured which they make use of in their business, and to render, when asked for it, an intelligent, and, above all, honest opinion as to what should be purchased.

This capacity and ability for forming correct opinions upon such matters is one of the very things for which successful engineers can command good wages, and it ought to require no argument whatever to convince them that anything which even gives the appearance of their having sold their opinions or influence will very soon deprive them of influence, and render their opinions entirely worthless. An engineer, or other mechanic whose opinion is asked by his employer regarding the choice of something which is to be purchased, owes it to himself and to his employer to give his opinion in accordance with his best judgment, based solely on the actual merits of the goods about which his opinion is asked. The employer has a right to expect this, and the manufacturer of the best goods, or of the goods best adapted to the particular circumstances, has a right to expect it; and both are defrauded if an opinion is rendered in favor of other goods, the manufacturer of which has bought the opinion and paid for it in advance.

As these demands are made principally to manufacturers, it must be seen that, if this practice goes on, it is only a matter of a very short time when every manufacturer will know that those upon whom he has been depending for expert advice upon these matters are liable to be influenced in their opinions by other considerations than a desire to do the best possible thing for all concerned, and, when that occurs, the very purposes for which these associations are formed will be rendered largely impossible of attainment.

We do not think, however, that there has been as much actual selling of opinions and influence as the ticket transactions would seem to indicate. There is abundant evidence to show that the individual members usually recommend the things which they believe to be the best, and at such times conveniently forget all about any implied pledges to recommend something else. It is incredible, for instance, that the members of the council referred to above would really be influenced in their opinions by reason of the paltry sum of $5.00, which would amount to perhaps twenty-five cents for each member. But whether they would be or not, the transaction gives the appearance of it, and is well calculated to injure the council and the individual members of it to more than a hundred times the amount of all such contributions they are likely to receive. Aside from this, there is a moral side to the question, which we need not speak of at length, but which we ask the members of all such societies to think about, believing that that is all that will be necessary to bring about a reform. One of the best by-laws which could be placed upon the books of any society of mechanics would be one prohibiting all such transactions, and one of the best subjects for discussion at the meetings would be the question of the importance to the members of studying to render their opinions on matters pertaining to the business valuable, and being very careful not to allow their opinions to be influenced in the least by any but purely mechanical and engineering considerations.

A Machine Shop Elixir.

Wonderful accounts are related of the effect of the so-called "Elixir of Life" alleged to have been discovered by Dr. Brown-Sequard.

There is probably a good deal of humbug connected with it, if, indeed, it is not all humbug. But what a great thing, for some machine shops we know of, would be an elixir which could be injected into the oil-holes of decrepit drill presses, consumptive lathes, and rheumatic planers, and which would renew and revivify them, fill out their skeleton frames into some resemblance to modern proportions, and make them a little better able to compete with their younger rivals!

And what a boon such an elixir would be to him who has been employed and placed in a responsible position, in the expectation, on both sides, that methods and processes were to be greatly improved and production cheapened, yet who finds it impossible to convince his employer that, in order to do this, some machines must go to the junk shop or cupola, and be replaced by others of more modern design, and better fitted for competition. No one, we think, can better appreciate the great value that such a discovery would have, than he who has been employed for the purpose of "modernizing" a shop, and has been told that plenty of financial backing would be forthcoming, and then finds that the ideas of the proprietors in regard to new equipment extend only to the purchase of new monkey-wrenches and oil-cans, and that the slightest intimation that they should part with any of the time-honored and revered machinery, which had served them so well in the past, was sufficient to convince them that a mistake had been made in the selection of a man to make improvements, and that he was bent upon reducing them to bankruptcy. A man finding himself in such a position could undoubtedly make good use of an elixir which would have an effect upon antiquated machinery, similar to that claimed for Brown-Sequard's discovery upon the human organism; but no such thing is likely to come to his relief. The cupola is, and is likely to remain, the only rejuvenator for machinery, and those who refuse to accept it must continue in the future, as in the past, to go to the wall—which, of course, is a good thing for the tool builders.

That is a story worth preserving—the one that comes from Chicago, narrating how the workingmen helped one of their fellows to a home. A Bohemian laborer, Mr. Seveck, by years of self-denial had saved money enough to build himself a home; not a mansion, but a sufficient shelter for himself and family. But in a furious gale his house was blown down, and utterly demolished. The savings of years were gone in a moment, and old age was coming on. Then it was that the workingmen—men scarcely better off than himself—carpenters and masons—gave the work of three Sundays to building him a new house. They finished it completely, ready for him to move into, and the women of the neighborhood provided a dinner, and the children brought flowers. True the work was done on Sundays, but it was a good deed, for the doing of which there is high authority. The *Chicago Tribune*, which notices the matter at considerable length, says: "The Sevecks are obscure people. The new house is a little one. The people who built it are not famous, but no more beautiful or charitable deed ever illuminated this world." When conspicuous examples of charity and good will are wanted, the place to look for them is amongst those who have little to give. There is a great deal besides lumber and nails, and stone and brick in this house that Chicago workingmen built for the Sevecks.

Literary Notes.

MECHANICS OF ENGINEERING. (FLUIDS.) A Treatise on Hydraulics and Pneumatics. For use in Technical Schools. By Irving P. Church, C. E., Assistant Professor of Civil Engineering, Cornell University.

This work treats on the mechanics of fluids as utilized in engineering. The first chapter is devoted to definitions, fluid pressure, tension of gases, bursting of pipes, and collapse of tubes. The chapters that follow treat on the pressure of liquids in tanks and reservoirs; earth pressure and retaining walls; immersion and flotation; steady flow of liquids through pipes and orifices; steady flow of water in open channels; dynamics of gaseous fluids; and impulse and resistance of fluids.

No doubt this work will be appreciated by students in technical schools. It will also be a valuable addition to the professional engineer's library. Practical men may also obtain much valuable information in the perusal of this work, but on the whole it will be difficult reading, as calculus is freely used. The book is published by John Wiley & Sons, 15 Astor Place, New York. Price, $3 00.

Poor's Manual of Railroads for 1889 is a book of 1,064 pages, and an appendix of about 250 more pages. Those who want to study the railroad operations of the country for the past year will find in this work a vast amount of information.

Good at first, this ponderous publication improves with age, and this, the 22d annual number, is better in some respects than any that have preceded it. Should any one discover defects in this work as now published, a little reflection upon the difficulty of getting together such an amount of information from every point of the North American Continent will satisfy them that the degree of perfection already reached is more than could be expected.

From this Manual we learn that the total miles of railroad in the United States at the close of the year 1888 was 156,082. Of this, 7,028 miles were constructed during the year, the rate of increase being 4.7 per cent. The share capital of the mileage completed at the end of 1888 showed an increase over 1887 of 5.9 per cent., while the funded debts had been increased by 9.5 per cent.

The number of persons transported in 1888 was 5.4 per cent. greater in 1887, the increase in this respect being but little greater than the increase in mileage.

The railroad interests of this country are second to no other interest, and the public may be thankful that the publishers of *Poor's Manual* are willing to undertake such a work as will enable any one desirous of knowing, to find out their cost, management and present condition. We do not know of any similar work that goes into railroad matters with such detail, and that gives such a variety of information.

Thomas D. West's book on American Foundry Practice is being translated into the Russian language, and will soon appear in Russia in book form.

QUESTIONS AND ANSWERS

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly and according to common-sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials nor location will be published.

(339) C. D., Newark, N. J., asks: Can you give me the rules for finding the diameters of a cone pulley to run with another when the dimensions of the latter pulley and the smallest diameter of the other are known? *A.*—See AMERICAN MACHINIST, Dec. 1, 1888.

(340) G. B. C., Chicago, asks: In setting thread tools to cut V-threads upon tapered work, is the center line of thread tool set at right angles with center line of the work, or at right angles with the side of the work? *A.*—It should be set at right angles to the center line of the work.

(341) J. L. D., Worcester, Mass., asks: Is there any kind of gas that will change the colors of blue, green, or red ink sketches, or water-color pictures, or oil paintings, if the objects are confined in the gas under pressure? *A.*—There is no doubt but what some kinds of gas will affect the colors, but we do not know what kind of gas to use to give certain results. Perhaps some of our readers may give the required information.

(342) M. H., ———, Minn., writes: Please tell me the cause of a locomotive tire becoming so hard where it has been slid, and which is the best way to get the hard places out of the tire when latter is to be turned? *A.*—The cause of the hard spots is the heating of these places as the tire slides upon them, and exposing the hot spots suddenly to the cold air. They do not generally extend across the tread of the tire, and are seldom more than 1-16 of an inch deep. Hence, to remove the hard spots, commence turning the tire from the outer edge until these spots are met, then remove them with a chisel; a few blows on the latter will often cause the hard places to fly off.

(343) C. D. B., Springfield, Ohio, writes: I have seen in your paper that coal oil will remove scales in the boiler. We have been using soda; lately we have used coal oil, and I can notice a little difference. Now, how much coal oil is safe to use? The boilers are 18 feet long, 4 feet 10 inches diameter, with eighty 3 inch flues; they have been in use two years, and it has been a difficult matter to prevent the formation of scale on the flues. We use a heater. *A.*—Use about a quart of kerosene oil per day in each boiler. Do not use crude petroleum. See page 7 of our issue of Dec. 17, 1887. Your second question we do not understand. Water at 26 to 28 degrees below freezing point will be ice, and we do not understand how you can make it flow.

(344) A. F. M., Chicago, Ill., asks: How can I find the proper travel of a slide valve? *A.*—Add the lap to the width of the steam port, and multiply the sum by 2; the product will be the travel of a valve which opens the steam port fully and no more. If it is desirable that the valve should travel a little beyond the steam port, say ¼ of an inch, then add the lap, width of steam port, and the amount which the valve must travel beyond the steam (¼ of an inch in this case), and multiply the sum by 2; the product will be the travel of the valve. If the valve is not to open the steam port fully, then add the lap to the required width of opening, and multiply the sum by 2; the product will be the travel of the valve.

(345) A. B., ———, writes: There are two persons, B. and O. O. says that, with a manila rope capable of sustaining 16,000 pounds, he will raise a weight of 160,000 pounds with a pair of blocks having 10 parts through lower sheaves, and the weight will be equally distributed on all parts of the rope, friction neglected. B. says that it will not be safe, that the strain is greatest on both the first and fixed part of the rope; therefore the weight cannot be safely raised with the said rope. Which is right? We will abide by your decision. *A.*—O is right; each part of the rope must sustain 1-10 of the weight; the free end of the rope will be subjected to the same tension or pull.

(346) I. H. P., Binghamton, N. Y., writes: Please give example in the simplest form for calculating the horse-power of a compound engine without indicator. Assume your own data. *A.*—It is customary to assume the expansion curve to be a rectangular hyperbola; and for the first approximation we calculate the horse-power of a compound engine of any sort, as if the total expansion occurred in the cylinder or cylinders that exhaust into the condenser. Consequently, it is the large or low-pressure cylinder only which enters into the calculations. The initial steam pressure in the large cylinder we assume to be the same as that in the small cylinder, or the cylinder into which the steam from the boiler first enters, and then expanded to the extent at which it enters the condenser. Here, then, we must know the rate of expansion, and when that is known, we must find the mean effective pressure. After this has been found, we apply the well-known rule for determining the I. H. P. of any simple engine, namely: $\frac{PLAN}{33{,}000}$; in which P = mean effective steam pressure in pounds per square inch; L = length of stroke in feet; A = area of piston in square inch; and N the number of strokes per minute, which is equal to the number of revolutions per minute multiplied by 2. Since, to find the mean effective pressure may be or appear to be the most difficult part of the calculation, it will be best to give an example in which the mean effective pressure is found when the initial steam pressure and the number of expansions are known, without any reference to the size of cylinders. Example: Let the initial steam pressure be 80 pounds, or 80 + 14.7 = 94.7 absolute pressure, and let the pressure of the steam at the time it is exhausted into the condenser be 15.78 pounds absolute; back pressure, 4 pounds. What will be the mean effective pressure per square inch, neglecting the effect of clearance and compression? Our first step will be to find the number of expansions, thus: Divide the absolute initial pressure by the absolute pressure at which the steam is exhausted; the quotient will be the number of expansions; hence, $\frac{94.7}{15.78} = 6$ expansions. To find the mean effective pressure, proceed as follows: Look for the number of expansions (6) in a table of hyperbolic logarithms + 1 (usually given in good books on steam engineering) under the head of numbers, and opposite it will be found 2.792; multiply this number by the absolute initial pressure, which will give a product of $2.792 \times 94.7 = 264.4024$; divide this product by the number of expansions; the quotient will be the *mean pressure* per square inch; $\frac{264.4024}{6} = 44.06+$ pounds. Subtracting the back pressure, we have a *mean effective pressure* of $44.06 - 4 = 40.06$ pounds. In a similar way we may find the mean effective pressure of any compound engine. Example 2. The large or low-pressure cylinder of a compound engine is 30 inches; stroke, 4 feet; number of revolutions per minute, 60; the mean effective pressure has been found to be 40.06 pounds per square inch; find the indicated horse-power. Applying the rule $\frac{PLAN}{33{,}000} =$ I. H. P., and remembering that the area of a piston 30 inches diameter is 706.86 square inches, we have $\frac{40.06 \times 4 \times 706.86 \times 60 \times 2}{33{,}000} = 412$ indicated horse-power.

BUSINESS SPECIALS

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Thursday for the ensuing week's issue.

Gear wheels and g-cutting. Grant, see adv., p. 16.

Link-Belting and Sprocket Wheels.

Send for Catalogue of Link-Belting.

Over 50,000,000 feet of Link-Belt in use.

Link-Belt Engineering Co., Philadelphia and N. Y.

Shafting Straighteners. J. H. Wells, Tampa, Fla.

Steel Name Stamps, etc. J. B. Roney, Lynn, Mass.

25″ Upright Drills. J. E. Snyder, Worcester, Mass.

28″ Upright Drills. J. E. Snyder, Worcester, Mass.

32″ Upright Drills. J. E. Snyder, Worcester, Mass.

36″ Upright Drills. J. E. Snyder, Worcester, Mass.

"Bradley's Power Hammers, the best in the world." 20 sizes. Bradley & Co., Syracuse, N. Y.

The best Upright Hammers run by belt are made by Jenkins & Lingle, Bellefonte, Pa.

R. Dudgeon, 24 Columbia st., New York. Improved Hydraulic Jacks and Roller Tube Expanders.

Drop Presses, Punches and Shears. Williams, White & Co., Moline, Ill., manufacturers.

Pattern and Brand Letters. Vanderburgh, Wells & Co., cor. Fulton & Dutch sts., New York.

Davis Key-Seating Machines kept in stock by Manning, Maxwell & Moore, 111 Liberty st, N. Y.

Selden Packing for stuffing-box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., N.Y.

Prestoline & Prestoline Paste, for cleaning & polishing metals. S. A. Smith, 23 S. Canal st., Chicago.

Ice and Refrigerating Machines, 131 sold, and all successful. David Boyle, 521 Monroe st., Chicago, Ill.

Bit Brace Die Holders and Bit Brace Taps. S. W. Card & Co., Mansfield, Mass.

Iron Planers from 16″ to 36″ wide by any length. H. C. Pease & Co., Worcester, Mass.

R. G. Du Bois, 715 11th St., Washington, D. C. Procures first class patents on inventions. Write.

Castings for small and medium sized vertical engines. Humphrey's Foundry, Bellefontaine, Ohio.

Guild & Garrison, Brooklyn, N. Y., manufacture steam pumps, vacuum pumps, vacuum apparatus, air pumps, acid blowers, filter press pumps, etc.

The best emery wheel made is the "Norwich." For particulars send to Montgomery & Co., 105 Fulton st., New York.

For the latest Improved Diamond Prospecting Drill, address the M. C. Bullock Mfg. Co., 138 Jackson st., Chicago, Ill.

The hook on steam engines is being supplanted by the Dill disconnecting device made by the T. C. Dill Machine Company, 726 Girard ave., Phila., Pa.

For Best Return Steam Traps, Pressure Regulators, Positive-Acting Pump Govs., Back-Pressure Valves, T. Kieley, 11 W. 13th st., N. Y. Send for des'n.

W. H. Hoffman, consulting engineer, 108 Liberty st., room 3, N. Y. Mechanical engineering in all its branches, working drawings for the transmission of power by steam, water, air and electricity.

Steam Boilers: Their management and working on land and sea. By Jas. Peattie. Practical facts from 30 years' experience. 230 pages illustrated, 12mo., cloth, $2. Circulars and Catalogue of Books for engineers free. E. & F. N. Spon, 12 Cortlandt st., N.Y.

H. B. Roelker, 22 Cortlandt st., New York, late Sup't Delamater Iron Works, will hereafter manufacture the Delamater Screw Propeller.
Propellers of same pattern and workmanship as formerly made by the Delamater Iron Works. Each designed for its special work at lowest prices.
Consulting Expert and Constructing Engineer.
Estimates made on machinery and on damages.

"Indicator Practice and Steam Engine Economy." By F. F. Hemenway. Contains plain directions for using the indicator, and making all required calculations from the diagram; also the principles of economy in operating steam engines and current practice in testing engines and boilers. Price $2, postpaid. Published by John Wiley & Sons, 15 Astor Place, New York.

"Binders" for the AMERICAN MACHINIST. Two styles, the "Common Sense," as heretofore sold by us, and mailed to any address at $1.00 each, and the "New Handy," mailed at 50c. each. The former has stiff board covers, while the latter has flexible covers, with full page opening flat. Either will hold the entire 52 issues of any volume. AMERICAN MACHINIST PUB'G CO., 96 Fulton st., New York.

Patterson, Gottfried & Hunter (Lim.), 146-150 Centre St., N. Y., carry a complete stock of Brush Copper, Celluvert Fibre, Oiled Paper, Hard Rubber, Rod & Sheet Brass, Brass, Copper & Iron Wire, Self-Hardening Tool Steel, Set & Cap Screws, Machine Bolts, Machine & Wood Screws, Taps & Dies, Files and Twist Drills, Blowers & Forges, Machinery, Tools & Hardware, Gear Wheels, Wood Pulleys, Shafting, Hangers & Belting. General factory supplies.

C. H. De Lamater & Co., New York, have for sale a very desirable lot of machinery and fixtures for Pattern Makers, Brass Founders, Machinists, Riggers, Blacksmiths and Boiler Makers; also stock of boiler iron, plate iron, sheet iron, patterns and pattern lumber, sand and clay, pipe and pipe fittings, shafting, hangers, iron and wood pulleys, belting, bolts, nuts, washers, screws, nails, packing, flasks, and the necessary small tools for iron and brass founders.

"Practical Drawing." By J. G. A. Meyer. The above series of articles, now running in the AMERICAN MACHINIST, should be closely followed by every student. They commenced with October 23, 1886 issue, and up to and including August 20, 1889 issue, 84 articles have been so far published. Copies containing these articles sent by mail to any part of this country or Canada at 5 cents each. AMERICAN MACHINIST PUBLISHING CO., 96 Fulton st., New York.

"Modern Locomotive Construction." By J. G. A. Meyer. The above series of articles, now running in the AMERICAN MACHINIST, are attracting the attention of railway mechanics all over the world. Commencing with the June 27, 1885 issue, 98 articles have thus far appeared up to and including the August 22, 1889 issue. Copies containing these articles sent by mail to any part of the U. S. or Canada, at 5 cents each. AMERICAN MACHINIST PUBLISHING CO., 96 Fulton st., New York.

MANUFACTURES

W. S. Wettich will build a saw mill at Millview, Fla.

The Wilkinson Paper Co. will build a mill at Carrollton, Ga.

The Lynchburg (Va.) Pulp and Paper Mill Co. will build a new mill.

C. G. West will build a furniture factory at Middlesborough, Ky.

A machine shop will be built at Acworth, Ga., by Baker & Rutheford.

Henry Martin is building a sash, door, and blind factory at Ozark, Ala.

It is said that the Union Pacific road will build large shops at Denver, Col.

The Arkansas Midland Railroad are enlarging their shops at Helena, Ark.

The Columbus (Ga.) Iron Works have increased their capital stock to $200,000.

S. P. Stover is interested in a company that is to build gas works at Atlanta, Ga.

The Stover Bicycle Co. has been recently organized at Freeport, Ill., with a capital of $100,000.

The Farmers' Alliance expect to build a cotton-seed oil mill and cotton ginnery at Thomaston, Ga.

The Union Steel Screw Company, of Cleveland, O., will improve their works by additions and new machinery.

The Medart Patent Pulley Company, St. Louis, Mo., has made a considerable addition to their foundry plant.

The Edison Machine Works, Schenectady, N. Y., have broken ground for a large addition to their present buildings.

The Georgetown Lumber and Manufacturing Co. will build a furniture and woodenware factory at Georgetown, S. C.

Eli Gaffney and others have incorporated the Gaffney Hardware Company, of Terrell, Texas, for the manufacture of hardware specialties.

C. M. Thompson is building a machine shop and foundry at Lexington, N. C.; also a sash, door and blind factory, and an engine and boiler house.

The car and machine works of the Mexican National Railway, at Laredo, Texas, are nearly completed. About 1,000 men will be employed.

Cincinnati parties have leased the Ironton Pig Iron Works, at Buffalo, N. Y. These works originally cost $500,000, and have been idle for several years.

It is stated that there has already been $20,000 worth of stock subscribed for the cotton waste and comber mill to be located at Dighton, Mass. The capital stock will be $50,000.

The Ingalls City (Va.) Investment and Improvement Co. has been chartered by Richard W. Tyler, Lawrence Sands, R. G. Rutherford and others, of Washington, D. C., and Prof. R. N. Pool, of Staunton, to build a town near Waynesboro. The capital stock authorized is $1,000,000.

The proprietors of the Cleveland Woolen Mills, Cleveland, Tenn., contemplate doubling the capacity of the mills. They have orders for months ahead, are working extra hours, and still are unable to fill their orders.

There is water-works agitation at Blue Rapids, Kan.; Emmetsburg, Ia.; Fort Smith, Ark.; Marlin, Texas; Weston, W. Va.; Santa Cruz, Cal.; Eureka Springs, Ark.; Pennacock, N. H.; Ainsworth, Neb.; Rouse's Point, Vt.

The electric light company at Eastport, Me., have decided to put up a new building at the gas works, into which the electric light plant will be moved. They will add another engine and boiler and a 500-light dynamo to the works.

The entire plant of the Union Furniture Co., of Rockford, Ill., was recently destroyed by fire. The loss is about $100,000. The company was conducted by Swedish-Americans, and all the stockholders were employed in the works.

The Canada Galvanizing and Steel Roofing Company has been incorporated at Montreal, with a capital stock of $50,000. The objects of the company are the business of galvanizing steel and metal roofing and general metal work.

It is stated that a combination of Eastern capitalists has been formed, to purchase all the coal property along the Monongahela River, and control the river coal business. It has been decided that it will require $13,000,000 to complete the venture.

Potts Brothers' Iron Company and the Glasgow Iron Company, of Pottstown, Pa., have increased the wages of their puddlers from $3.20 to $3.50 per ton, and their other employes have been given a corresponding advance. The raise affects about 500 men in the two works.

The Duplex Electric Gas Motor Company has been formed at Edwardsville, Ill., for the manufacture of steam, gas and electric engines and appliances, the building of public works, and the manufacture of necessary machinery and appliances for their operation. Capital stock, $1,000,000.

The Bridgeport Machine Tool Co., Bridgeport, Conn., have issued a photographic catalogue of machine tools made at the works. The illustrations are photographs pasted to blank leaves, with brief description on opposite pages. The catalogue is artistically printed on fine paper, and bound with flexible morocco cover.

The Sweetwater Milling Co. has bought a site at Chattanooga, Tenn., and will build a five-story brick roller mill, 50x100 feet in dimensions, and capable of making 500 barrels of flour and 1,500 bushels corn meal daily. The mill will be driven by a steam plant of 250 to 300 horse-power. In connection with the mill the company will build a 100,000 bushel elevator and a large warehouse.

The Pond Engineering Co., St. Louis, Mo., have sold the Fort Scott Electric Light and Power Company, Fort Scott, Kan., a 125 horse-power Armington and Sims engine. This is the third engine which they have sold the Fort Scott company within a very short time. They are also furnishing Guthrie, Chase & Company, Milford, Iowa, a 50 horse-power Schutte exhaust steam condenser, complete with all pipe, valves, etc.

The litigation pending for a year over the rebuilding of the Pennsylvania Tack Works at Norristown, Pa., has been adjusted, and the work of erecting the structures will be begun at an early date. The works were burned down after the tack company had taken possession, but before the papers had been made out, and the tack company contended that the Norristown Improvement Company, which erected the buildings, should bear the loss. Concessions have been made by both parties, and it is thought that the new works will be in operation in four months.

Among other improvements recently made by The Walker Manufacturing Co., Cleveland, Ohio, has been the building of a very large pit lathe, capable of turning work up to 30 feet diameter, by 8 feet 6 inches face. This lathe is a combination tool, it being not only a pit lathe, but also a large planer, in which surfaces 30 feet long by 8 feet 6 inches wide can be planed. It also has facing attachments for the proper facing up of the ends of columns and girders. In addition, there are gear planer attachments, whereby the teeth can be planed in gears of any size up to 30 feet diameter, and of any proportions desired.

An Ishpeming, Mich., dispatch says: Iron ore shipments have continued as heavy in August as in July, notwithstanding the predictions to the contrary by many shrewd observers. For the four weeks ending Aug. 28 there were shipped in round numbers, 1,035,000 tons of iron ore from the six ports of the Fort Lake Superior iron ranges, and for the last three days of the month at least 120,000 tons more will be forwarded, making August shipments over 1,150,000 tons, or even larger by a few thousand tons than the large shipments of July. Should shipments continue at their present rate for six weeks longer, 6,000,000 tons of ore will have been forwarded by the middle of October, and the season of navigation is not likely to close before November 10 or November 20. The vast amount of ore in sight, and the great number of districts from which it is procured in this country, make it impossible for any combination of capital, no matter how powerful, to form a trust and advance prices to any appreciable extent. The low tariff on iron ore, only 75 cents a ton, under which hundreds of thousands of tons are annually shipped into this country even at the present prices of ore, renders it further impossible for any iron ore trust to succeed.

Machinists' Supplies and Iron.

NEW YORK, Sept. 7, 1889.

Iron—American Pig.—The aggregate amount of business has been large during the past week, but has been mostly confined to the current wants of consumers. Prices have been firmly maintained, and the tendency seems slightly upward. We quote, Standard Northern brands, No. 1 X Foundry, $17 to $18; No. 2, $16 to $17. Southern brands, No. 1, $16.75 to $17.25; No. 2, $16 to $16.50. Northern brands, Grey Forge, $15.25; Southern brands, $15.

WANTED

"Situation and Help" Advertisements only inserted under this head. Rate 30 cents a line for each insertion. About seven words make a line. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue.

Position wanted by an experienced mech. draftsman; six years' shop exp. Y., AM. MACHINIST.

Wanted—A good mech. draftsman for gen. work; state exp., salary, etc. Lock Box 96, Steelton, Pa.

An experienced mechanical draftsman wants a position. K. P., AMERICAN MACHINIST.

Steady young man desires position where he can learn mechanical drafting. Address H. N. Wells, Aquebogue, L. I., N. Y.

Wanted—Job in toolroom or other fine machine work, by good filer and lathe hand; used to accurate work. Address "Reamer," P. O., Allegheny, Pa.

A first-class mech. draftsman, able to take charge of the drawing office, is open for engagement. Address S. R., AMERICAN MACHINIST.

Mech. engineer, 29, educated at leading engineering college, England, wants situation; 9 years' exp. in shops and drawing office. King's. AM. MACH.

Wanted—Foreman for shop making iron pipe fittings, iron valves, radiators, and steam-heating specialties. "Manufacturer," AMERICAN MACHINIST.

Master mechanic, of large experience in handling men, desires position in charge of manufacturing or repair shops. Master Mechanic, AM. MACHINIST.

Wanted—15 good machinists can find steady work at Jones & Lamson Machine Co.'s new shop at Springfield, Vt.

Wanted—A mechanical engineer and draftsman, capable of making estimates for general machine shop work, and familiar with shop practice. Address P. O. Box 93, Albany, N. Y.

Wanted—A wrought-iron worker; a man who thoroughly understands wrought-iron, making grilles, stoop railings, etc. Address, stating previous experience, M. Mahony, Troy, N. Y.

Wanted—First-class machinists. None others need apply. Wages $2.25 per day of 10 hours, with chance for advancement if found worthy. The Pond Machine Tool Co., Plainfield, N. J.

Practical foundryman, 35 years' experience in all branches of the iron business, and 19 years a foreman, desires position as such. R. L. N., 151 Oakland street, Brooklyn, E. D., N. Y.

Draftsman wanted to assist general superintendent; preference given to one familiar with Corliss engine work; state age, experience, and salary expected. Address Robert Whitehill, Newburgh, N. Y.

Wanted—Foreman pattern maker, to take charge of shop in Western city. Must have had experience in patterns for architectural iron work. Address, stating age and exp., D., care AM. MACHINIST.

Wanted—A situation as foreman of a small foundry employing 3 to 6 men (country preferred), by a good moulder, American, of strictly temperate habits; had 25 years' exp. C. C., AM. MACHINIST.

Foreman moulder wanted; one who is a good, energetic mechanic, understands his business, and capable of handling from 25 to 40 men on heavy engine and mill castings. H., AMERICAN MACHINIST.

Wanted—A young man, 30 to 35 years old, as works manager. Must thoroughly understand New England machine shop practice, and be well up in rapid machining of metals. Address Agent, care AMERICAN MACHINIST.

Wanted—A skilled mechanic for foreman; must be a thorough modern workman of extensive practical and scientific experience; fine tool and construction work, requiring accuracy and knowledge of "short cuts." Good opening for the right man; state exp., refs., etc. Mech. Supt., AM. MACHINIST.

Wanted—A young or middle-aged man to take charge as foreman in erecting department of machine shop engaged in building stationary and automatic engines in southern Pennsylvania; pay, $18 per week, no lost time, and extra for overtime; must be familiar with valve motions, and know how to set them; would prefer one who understands the indicator; permanent employment to a competent, energetic man. Send references, and state age; one who has had experience preferred. Intemperate men need not apply. Address Box 17, AM. MACH.

MISCELLANEOUS WANTS

Advertisements will be inserted under this head at 35 cents per line, each insertion.

Cheap 2d hand Planers, etc. S. M. York, Clev'd., O.

Koopman's Scales for quick measurements.

Just out; aluminum-steel hack-saws, hard but not brittle. Crescent Mfg. Co., Cleveland, O.

New catalogue of engineers' specialties free. Crescent Mfg. Co, Cleveland, O.

Light and fine machinery to order; Foot Lathe. Catalogue for stamp. E. O. Chase, Newark, N. J.

August C. Christensen, 24 State st., N. Y., Consulting Engineer. Designs of all kinds of Machinery.

Turned and Highly Polished Iron and Steel Shafting a specialty. Merwin McKaig, Cumberland, Md.

Complete list of our Scales and other new tools for 2c. stamp. A. T. Koopman, Chicago.

For Sale—A small machine shop; excellent opening. Asbury, Grieder & Co., Roanoke, Va.

D. J. Kelsey, M. E., Designer of Automatic Machinery, 31 Insurance Building, New Haven, Conn.

Designs and working drawings for special machinery, tools, etc., attended to by experienced draftsman. "Draftsman," Box 107, AM. MACHINIST.

Engineers wanted to send their addresses and receive free a 25 cent book, "Hints and Suggestions for Steam Users." Lord & Co., P. O. Box 1262, Phila., Pa.

Latest and best Planer and Drill Press Chucks. Expanding Mandrels. The Brightman Machine Company, Cleveland, Ohio.

Wanted—To buy second-hand lathes, planers and shapers of all sizes; must be cheap and in good order. Fosdick & Plucker, 6th and Culvert Streets, Cincinnati, O.

How to remove and prevent scale in steam boilers at a cost of ten cents a week. Send postal for circular to Pittsburgh Boiler Scale Resolvent Co., Pittsburgh, Pa.

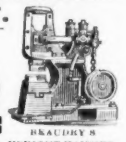
Wanted—To sell patent, or have manufactured on royalty at reasonable figures, Huyett's Drawing Board, illustrated in AMERICAN MACHINIST, Sept. 15, 1888. Address Mrs. D. D. Huyett, Waynesboro, Pa.

Established 1852. BRADLEY'S POWER HAMMERS

The BEST in the WORLD

RUN BY BELT.

Over 1500 in USE



BRADLEY'S HELVE HAMMER. BRADLEY'S UPRIGHT HAMMER. BRADLEY'S UPRIGHT HAMMER.

BRADLEY'S HEATING FORGES

Indispensable in all shops to keep BRADLEY'S CUSHIONED HAMMERS and men fully employed and reduce the cost of production.

BRADLEY'S HARD COAL HEATING FORGE. BRADLEY'S SOFT COAL FORGE.

BRADLEY & CO. SYRACUSE, N.Y.

43 Murray st. NEW YORK; 98 Sudbury st. BOSTON, MASS.

STANDARD OIL CUPS.

FOR HIGH ENGINES SPEED & MACHIN- DYNAMOS. ERY.

A. J. WILKINSON & CO.,

184 Washington Street,

BOSTON, MASS.

TO BUYERS AND USERS OF MACHINERY.

You will save money and get what you pay for by having us examine machinery and report on the same before buying. Try us and be convinced.

We also make drawings and blue prints, and give SPECIAL ATTENTION TO THE DESIGNING OF MACHINERY FOR ALL PURPOSES. Send for Blue Book giving more information.

JONES & MACK,

MECHANICAL ENGINEERS,

5 W. 4th Street, Cincinnati, O.

PATENT UNIVERSAL SCREW-CUTTING CENTER DEPTH ANGLE AND TWIST DRILL GAUGE.

J. WYKE & CO., Fine Machinists' Tools.—E. Boston, Mass.—Send for Circular

STEAM ENGINE DESIGN.

For the use of Mechanical Engineers, Students and Draftsmen. By Prof. Jay M. Whitham, M. E. Numerous illustrations, full page and folding plates, 8vo., cloth - $6.00.

John Wiley & Sons, Astor Place, N. Y.

SEND FOR CIRCULAR.

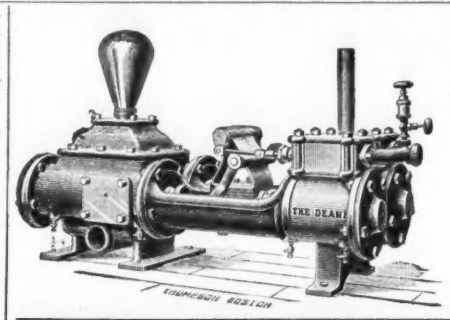
VOLNEY W. MASON & CO.,

Friction Pulleys, Clutches and Elevators,

PROVIDENCE, R. I.

SOLID EMERY OIL STONES AND Triple Coated KNIFE SHARPENER

WHOLESALE ONLY BY THE TANITE CO., STROUDSBURG PA.



THE DEANE STEAM PUMP CO.,

HOLYOKE, MASS.,

New York, Boston, Chicago, Philadelphia, St. Louis,

Manufacturers of

STEAM and POWER

PUMPS

FOR ALL PURPOSES.

SEND FOR CATALOGUE.

STEEL

For tools and dies of all kinds. So uniformly good as to leave no excuse for buying foreign products at any price.

MILLER, METCALF & PARKIN,

136 FIRST AVENUE, PITTSBURGH, PA. 64 and 66 SO. CLINTON ST., CHICAGO, ILLS. 480 PEARL STREET, NEW YORK.

Sebastian, May & Co.'s Improved Screw Cutting FOOT AND POWER LATHES

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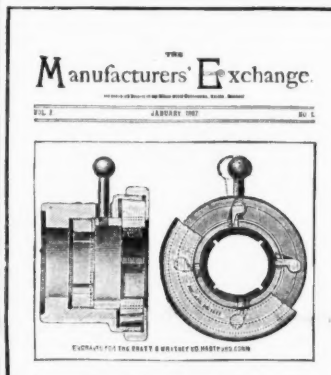

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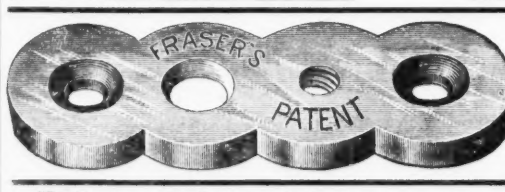

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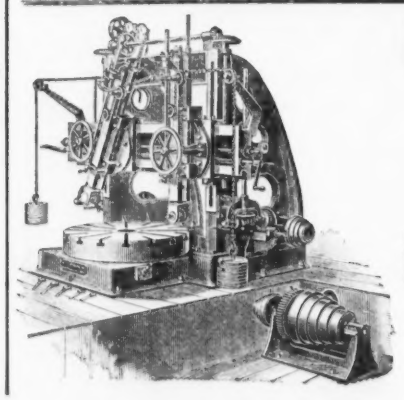

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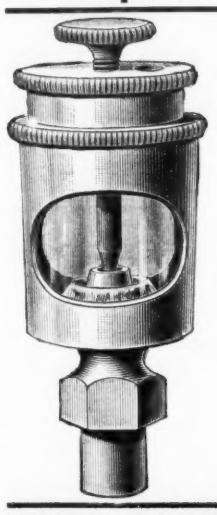

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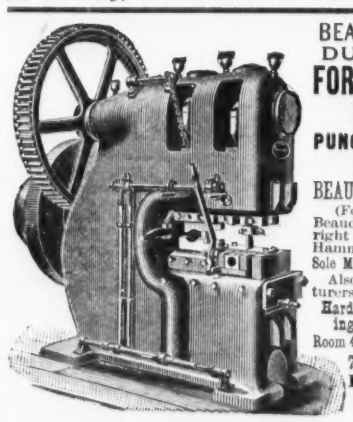

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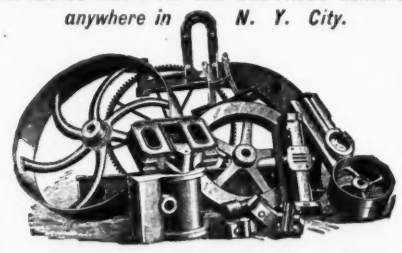

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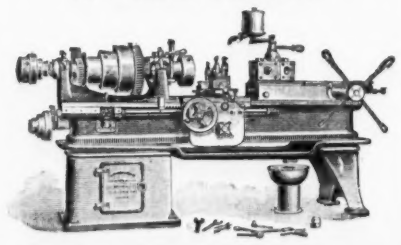

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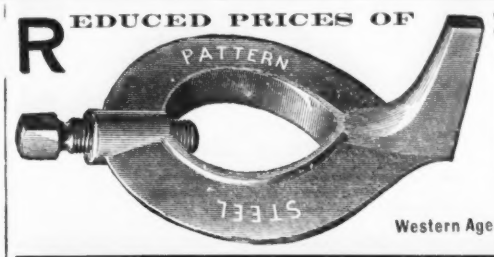

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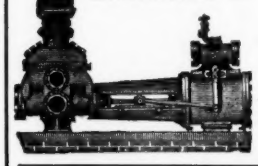

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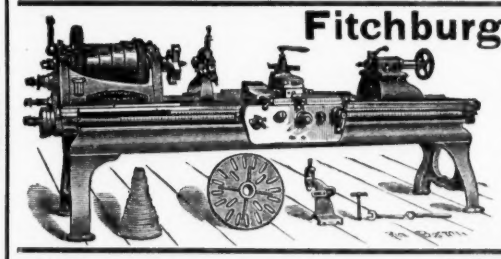

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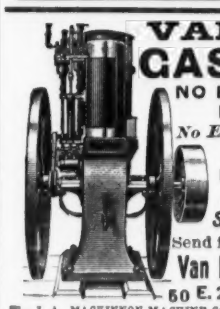

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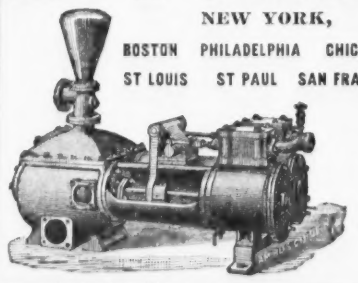

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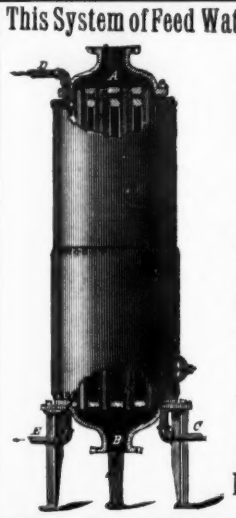

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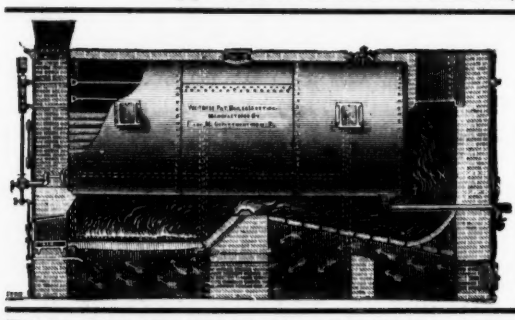

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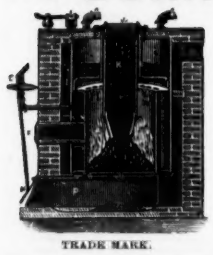

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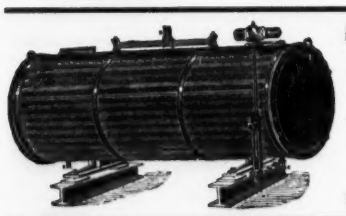

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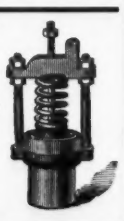

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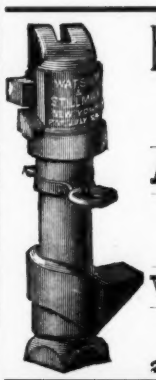

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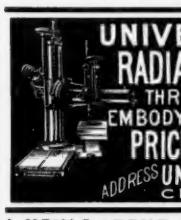

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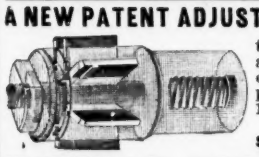

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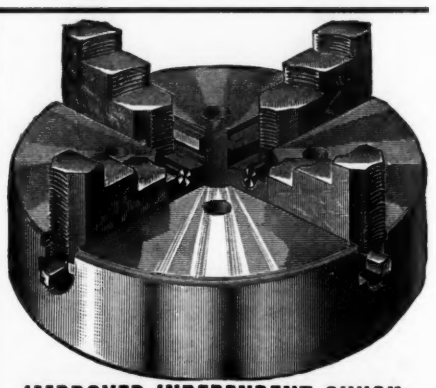

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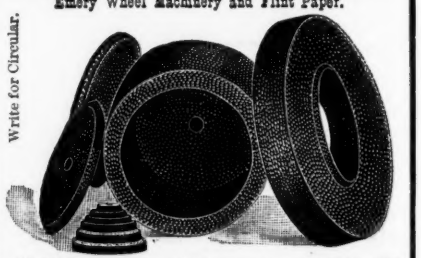

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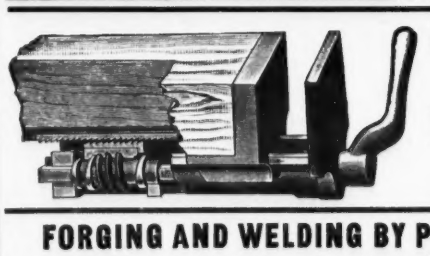

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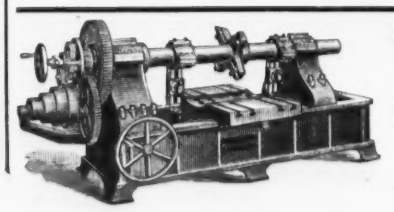

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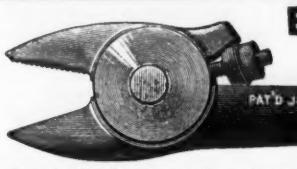

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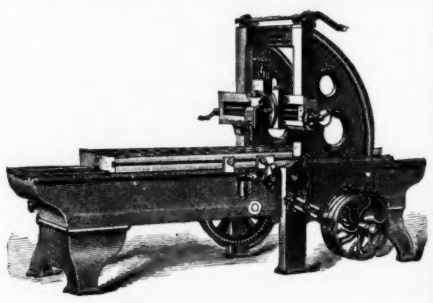

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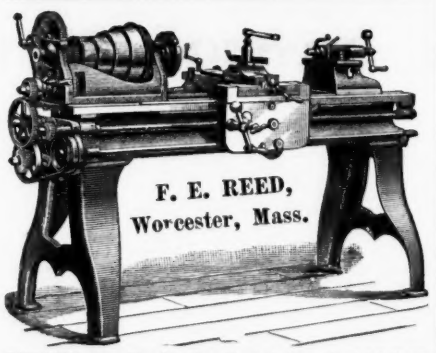

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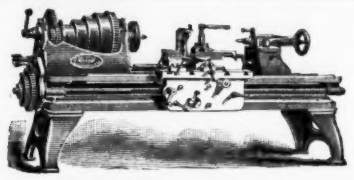

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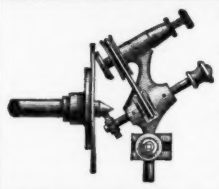

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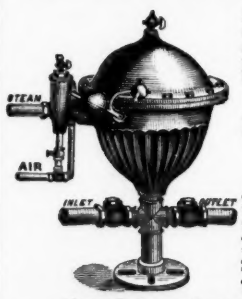

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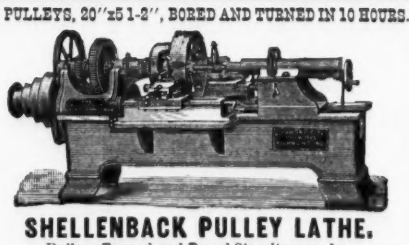

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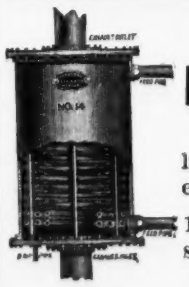

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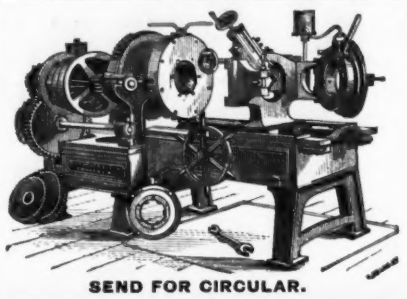

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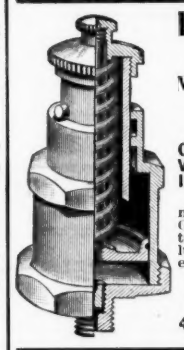

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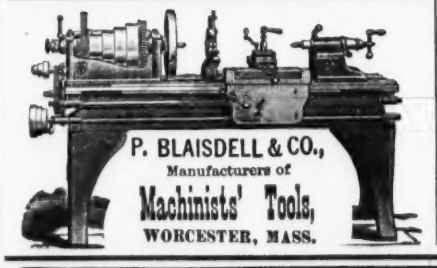

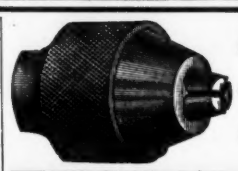

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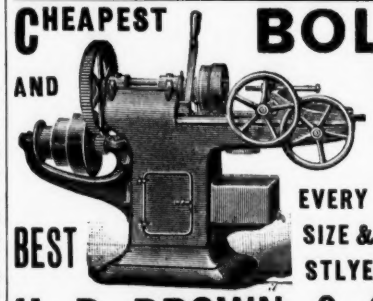

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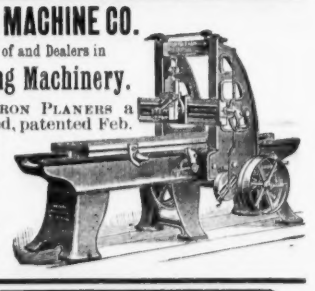

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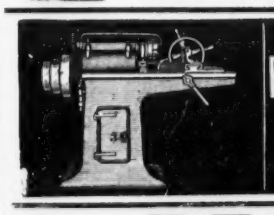

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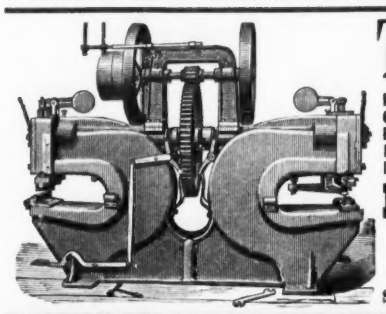

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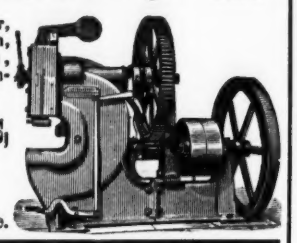

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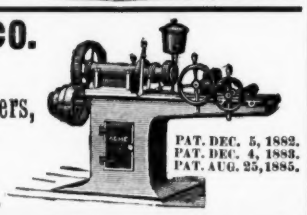

PAT. DEC. 5, 1882.
PAT. DEC. 4, 1883.
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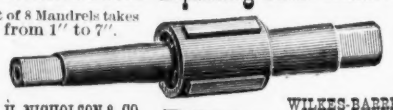

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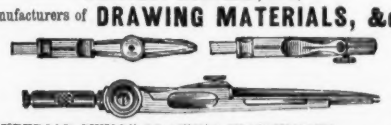

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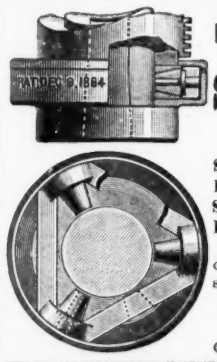

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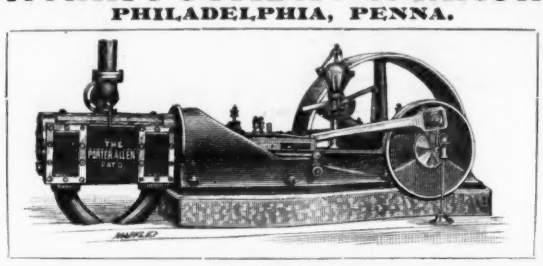

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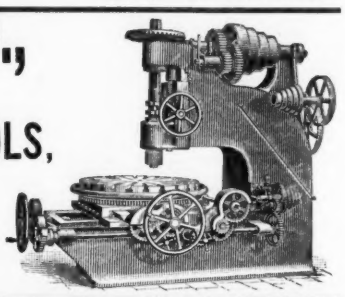

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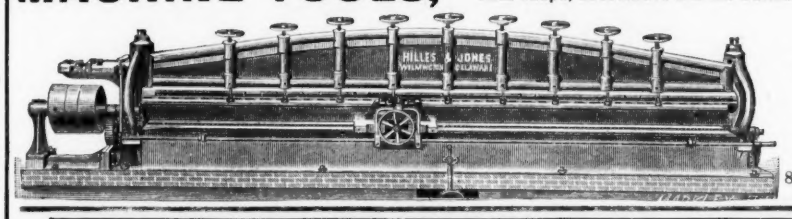

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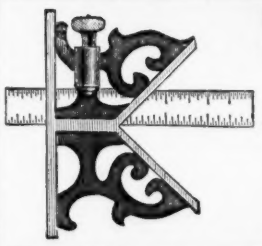

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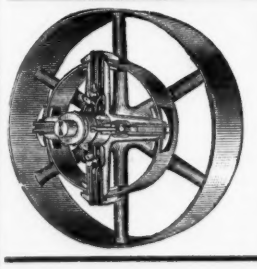

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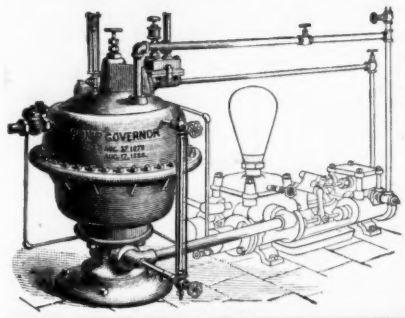

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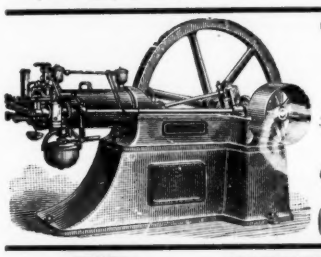

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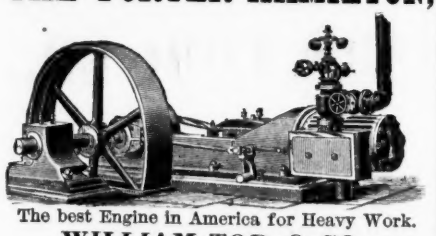

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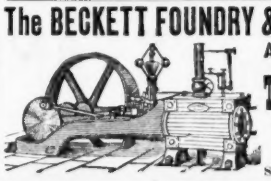

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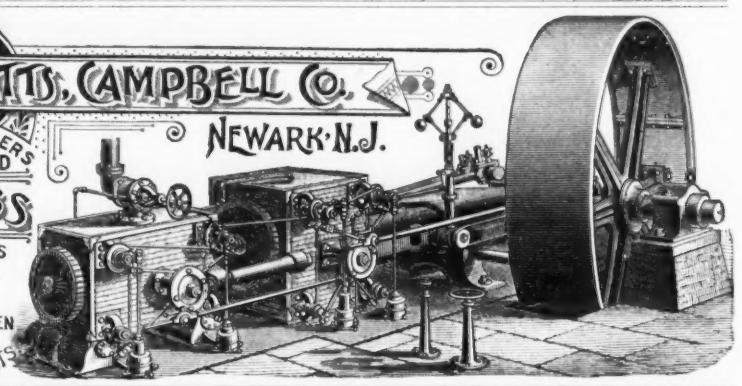

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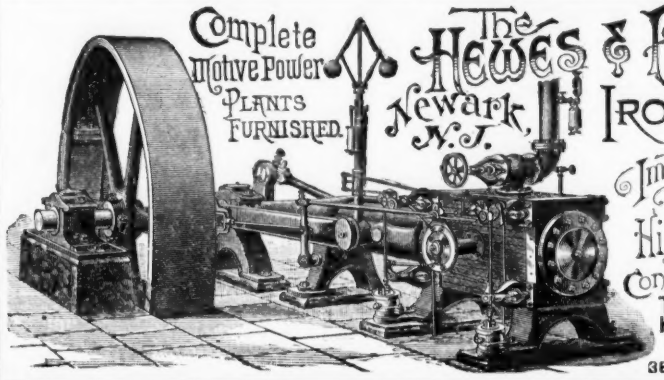

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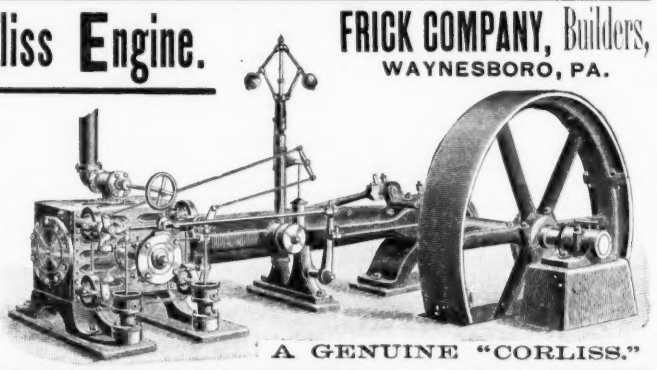

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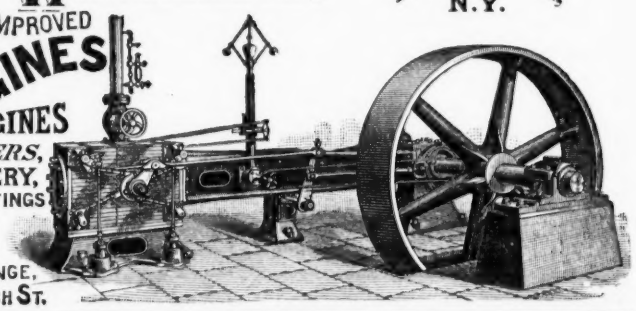

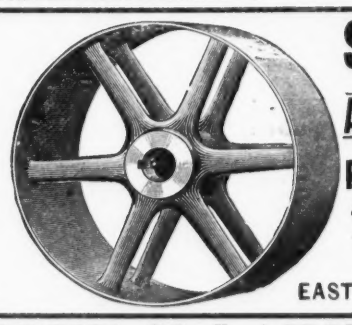

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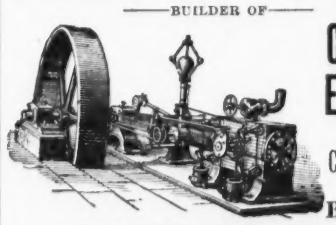

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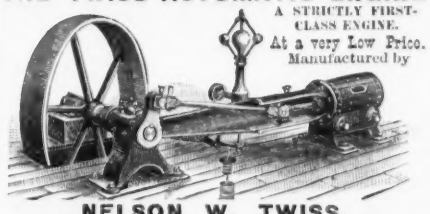

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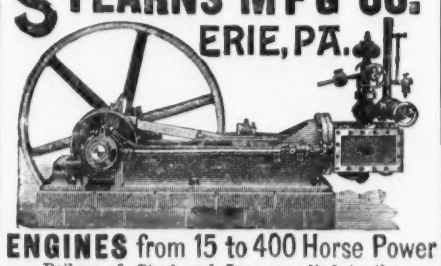

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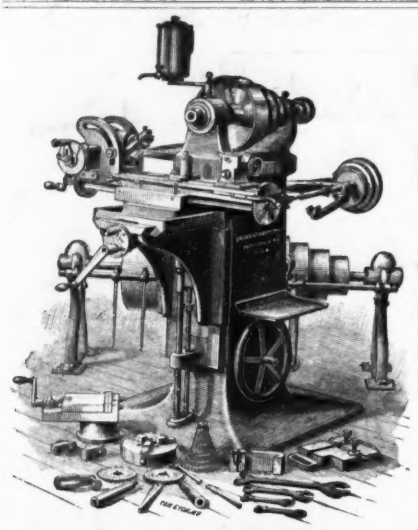

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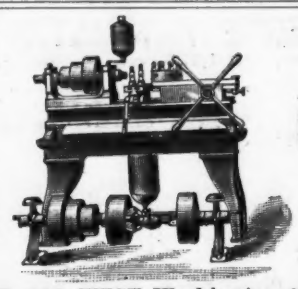

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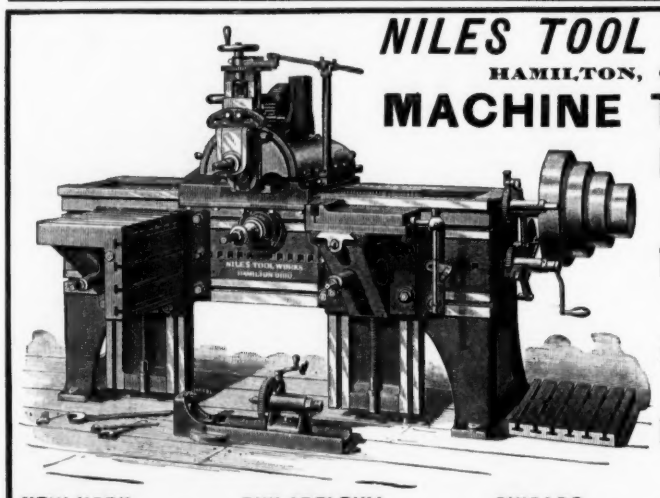

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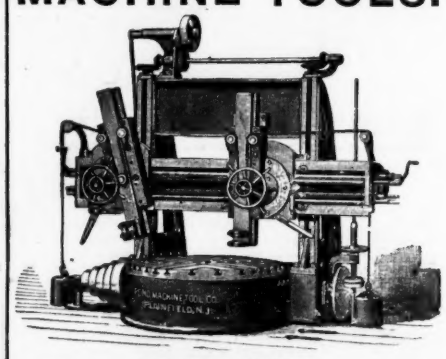

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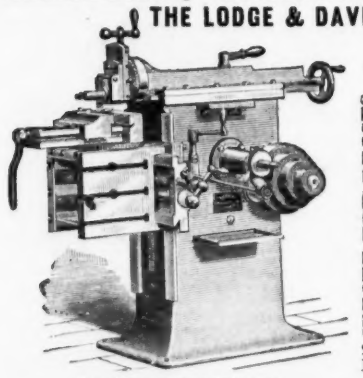

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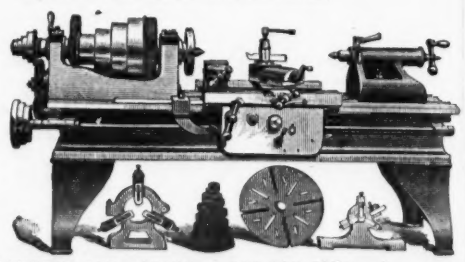

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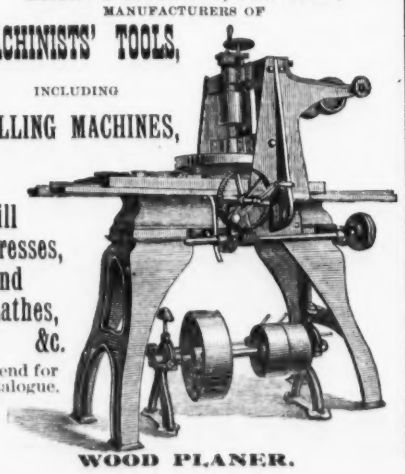

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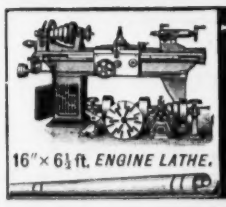

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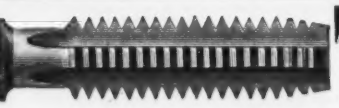

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